SONETest™ SERIES

ST-103 TEST SET

Microwave Logic

MP MASTER
MA32960

SONETest™ SERIES
ST-103 TEST SET

OPERATIONS MANUAL

Part Number 8900-0004

Microwave Logic

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MANUAL REVISIONS

Revisions to the manual are made from time to time as required by changes to the product or for correction of errors. In any discussion with the factory relating to product operation or specifications, please have the manual on hand so that the latest Revision Number may be referenced.

REV NO.	DATE	DESCRIPTION	PAGES EFFECTED
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SERVICE INFORMATION

WARRANTY

All Microwave Logic products are warranted against any defect in material and workmanship for a period of one year from the date of delivery. Microwave Logic will repair or replace products which prove defective during the warranty period.

NO OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING FITNESS FOR PURPOSE, MERCHANTABILITY OR OTHERWISE IS GIVEN.

SERVICE ASSISTANCE

For repair information and service assistance please contact Microwave Logic Customer Service department at (508) 649-6099. The factory's experience and expertise will save valuable time in evaluating and correcting any unit malfunction.

REPAIR RETURNS

If the unit must be returned to the factory for repair please do the following:

1) Contact the factory for a Return Authorization Number (RAN). The use of a RAN will ensure prompt repair, and ease tracking of your unit.

2) Pack the unit in it's original packing materials if possible or other suitable material, such as foam or bubble-wrap, to safely ship the unit. Pack unit in a double-walled carton, and seal the carton with suitable tape. Display the RAN number on the outside of the carton.

3) Ship to :

   Microwave Logic, Inc.
   20 Cummings Road
   Tyngsboro, MA 01879

   Attn: Customer Service

ST-103
STS-1/OC-3/OC-12
SONET TEST SET

2.0 INTRODUCTION

The ST-103 SONET Test Set consists of a portable or rack mount transmitter and receiver. Primarily intended for the development lab, factory and field testing, it provides extensive SONET STS-1, STS-3 and OC-3 signal generation and detection with frame format in accordance with Bellcore TR-TSY-000253 and CCITT Recommendations G.708, G.709.

STS-12 and OC-12 are provided as a plug-in option on both Transmitter and Receiver and are described in the Options Section.

The ST-103 SONET Test Set feature set includes: VT1.5 and DS3 payload capabilities with full pointer, error control and frame byte access. Both optical and electrical input/output will be provided for the STS-3 level of the SONET hierarchy. Electrical input/output will be provided for the STS-1 level. In addition, all internally generated DS1 and DS3 test patterns will be provided to eliminate the need for other test equipment at these rates. The capability of mapping external DS1 and DS3 signals into SONET payloads is also provided. The user interface will be completely menu driven with extensive help menus for ease of use. Serial RS-232C, GPIB and, on the receiver, a Centronics parallel printer port will be offered as standard equipment for remote control. In addition to performing all standard SONET Frame and Payload measurements, the set will operate as a stand-alone DS1 or DS3 transmitter/receiver, making standard measurements.

2.1 PRODUCT FEATURES

- Payload selection; VT1.5 Asynchronous Floating, VT1.5 Bit Synchronous Locked, Asynchronous DS3
- Receiver "Frame Capture", stores up to 40 STS-1 Frames in RAM
- T1X1 Pointer Sequence generation for Desynchronizer testing
- B1, B2, B3, BIP-2 Calculations
- Accepts external DS1 or DS3 Payload
- Pointer Position Control, VT and SPE
- Error injection into Frame and/or Payload
- 3 STSX-1 Outputs
- Payload Bit, Parity Measurements
- OC-3 Laser Source
- Multi-line Menu controlled display
- Line, Section, Path Overhead Hex Display
- B1, B2, B3, BIP-2 Error Measurement
- Remote control via RS-232C and GPIB
- Current & History Status Indicators
- Programmable Transmitter Byte Wide Sync
- Optional OC-12 Input/Output

PREPARATION FOR USE

3.1 UNPACKING

The ST-103 Transmitter's or Receiver's shipping container should be inspected for damage to exterior and interior. If damage is found or suspected, keep the container until the instrument's operation has been verified and it has been determined that it has suffered no mechanical damage. If the instrument does not pass the Verification of Operation as outlined in Paragraph 3.6, notify Microwave Logic as instructed in Section 1. If the shipping container has been damaged, notify the carrier as well as Microwave Logic and retain the container for inspection.

3.2 UNIT BENCH TOP USE

The ST-103 Transmitter or Receiver unit is designed to be placed on a flat surface, or angled from the surface using the adjustable front feet or rotating carrying handle. To alter the handles orientation, press in both handle locking buttons, rotate to the desired angle, release the buttons; the handle will click into a locked position. Assure that the handle is locked before placing the unit on the work surface.

3.3 RACK MOUNTING

The unit may also be rack mounted with an optional 19" rack mounting adapter. Usually the test set will be ordered with the rack mount installed. If, however a separate rack mount is purchased, installation is accomplished with the following steps:

a) Remove handle
   1) Pry off handle detente buttons (2) with a small flat screwdriver inserted at a point on the horizontal axis of the unit.
   2) Remove screws (2) hidden by the buttons.
   3) Stretch the handle outward, remove.

b) Remove front and rear bezels (4 screws).

c) Slide out side trim strips from aluminium side rails.

d) Add square nut and plastic retainer to each side rail.

e) Loosely screw (note these are metric screws) T-shaped panel bracket to middle 2 square nuts in each side rail.

f) Attach rack mount panel brackets (4 8-32 nuts), slide bracket in rails as necessary.

g) Replace front bezel (2 metric screws), sliding rack mount panel and brackets in side rails for alignment.

h) Tighten panel bracket screws (4 previously loosely attached) to the side rails.

j) Replace rear bezel (2 screws) keeping top and bottom covers in place.

3.4 AC POWER

The AC power connector on the rear panel accepts 115 VAC input only. To change the line fuse, disconnect the AC line cord and slide the fuse cover upwards and remove the fuse. Install correct value fuse (2 AMP SLO-BLO, Little fuse 3AG) into holder. Close the fuse cover and plug in the line cord. The unit is now ready for power up.

3.5 UNIT COOLING REQUIREMENTS

The rear panel fan openings and top mounted ventilation slots must be keep clear for proper cooling of the unit. Allow a minimum of 2 inches of rear panel clearance, and 1 inch of top clearance, while operating the unit. The unit is not designed to operate standing on the rear side.

3.6 VERIFICATION OF OPERATION

This verification procedure provides Incoming Inspection with a tool to be able to verify that the ST-103 Transmitter and ST-103 Receiver are functioning correctly. It may also used to familiarize the user with the test set operation.

To verify operation of either the ST-103 Transmitter or Receiver, both units are required. When shipped from the factory, the test set has been configured with a default set-up. This default setup is detailed in Appendix B and E for Transmitter and Receiver respectively.

If, during the verification procedure, the Transmitter or Receiver does not show the condition or result described, a trouble may exist in either the Transmitter or Receiver. It is recommended that first the user verify that the procedure has been followed and then, if the same result is obtained, consult the factory for technical assistance.

Customer Service
Microwave Logic, Inc.
20 Cummings Road
Tyngsboro, MA 01879
Telephone (508) 649-6099

WARNING: BE SURE THAT THE INSTRUMENT IS GROUNDED. The instrument is supplied with a three-conductor AC power cord. Under no circumstances should the instrument's power cable be plugged into any outlet other than an approved three contact electrical outlet.

3.6.1 Power On

Make certain that the instrument's front panel power switch is in the OFF position. Using the AC line cords supplied, apply 115 VAC to the Transmitter and Receiver.

Turn power on by pressing the front panel POWER switch. The front panel lights will all light momentarily as the software version and Microwave Logic logo are displayed. After the logo is displayed the current CONFIGURATION screen, which details the factory default set-up, will be displayed.

Depress each of the menu keys listed below and verify that the associated menu appears on the display.

MODE	ERROR (TX)	INDEX
TOH/POH	MEASURE (RX)	POINTER
	SPE	

Connect a 75 ohm BNC cable to one of the three Transmitter's STSX-1/DSX-3 outputs. Connect the other end to the Receiver STSX-1 Input. Press the Receiver HISTORY RESET key. Verify that all Receiver front panel LEDs are off.

3.6.2 DS3 Payload Verification

After verifying that the menus have changed, again depress the "MODE" keys (on both Transmitter and receiver), use the up, down cursor keys to select "QUICK SETUP..." and depress the "ENTER" keys. Now change the selection to "STSX-1, DS3 PAYLOAD" (if not already selected) and depress "ENTER". The displays will now change to the "CURRENT CONFIGURATION" menu. Depress the RUN/STOP key 2 times to reset the Receiver.

At this time there will be no lights on in the Receiver's status box. On the Receiver's display look at the "ERRORS:" and verify that there are only rows of dots. If there are actual errors there will be error indicators for each type of payload error being recorded.

3.6.3 VT1.5 Payload Verification

Depress the "MODE" keys, select "QUICK SETUP", then depress the "ENTER" keys. Select "STSX-1, VT1.5 PAYLOAD" and depress "ENTER" keys. The display will change to the "CONFIGURATION MENU". Depress the RUN/STOP key on the Receiver 2 times to reset. There will be no lights on in the Receiver's status box. On the Receiver's display look at the "ERRORS:" and verify that there are only rows of dots.

3.6.4 OC3, DS3 PAYLOAD VERIFICATION

Install a single mode fiber jumper cable from the Transmitter optical output to the Receiver's optical input.

Depress the "MODE" keys, select "QUICK SETUP", then depress the "ENTER" keys. Select the OC3, DS3 PAYLOAD" and depress the "ENTER" keys. The red light above the optical connector on the Transmitter will now be on to show that the laser is active. The "CONFIGRUATION MENU" will be on the display.

Depress the RUN/STOP key 2 times on the Receiver and there will be no lights on in the Receiver's status box. Look at the "ERRORS:" and verify that there are only rows of dots.

3.6.5 OC3, VT1.5 Payload Verification

Depress the "MODE" keys, select "QUICK SETUP", then depress the "ENTER" keys. Select "OC3, VT 1.5 PAYLOAD" and depress "ENTER" keys. The display will change back to the "CONFIGURATION MENU". Depress the RUN/STOP 2 times on the Receiver to reset. There will be no lights on in the Receiver's status box. On the Receiver's display look at the "ERRORS:" and verify that there are only rows of dots.

3.6.6 (Option) OC12, DS3 Payload Verification
OC12, VT1.5 Payload Verification

In order to use OC12, the option for OC12 must be installed. If the Transmitter and Receiver are not equipped with this option the "QUICK SETUP" menu will not display these selections: OC12, DS3 Payload or OC12, VT1.5 Payload.

The OC12 option can be verified in the same sequences as done above for OC3, DS3 Payload or OC3, VT1.5 Payload. Under the Quick setup selection, select the OC12 option in place of OC3.

3.6.7 DSX-3 Verification

Depress the "MODE" keys, select "QUICK SETUP", then depress the "ENTER" keys. Select "DSX-3 OUTPUT/INPUT" and depress "ENTER" keys. The display will change to the "CURRENT CONFIGURATION" menu. Depress the STOP/RUN key on the Receiver 2 times to reset. There will be no lights on in the Receiver's status box. On the Receiver's display look at the "ERRORS": and verify that there are only rows of dots.

3.6.8 DSX-1, Output

Install a WEC0 310 cable from the Transmitter's DSX-1 output to the Receiver's DSX-1 input.

Depress the "MODE" keys, select "QUICK SETUP", then depress the "ENTER" keys. Select "DSX-1, OUTPUT/INPUT" and depress "ENTER" keys. The display will change to the "CURRENT CONFIGURATION" menu. Depress the RUN/STOP 2 times to reset. There will be no lights on in the Receiver's status box. On the Receiver's display, look at the "ERRORS": and verify that there are only rows of dots.

TRANSMITTER OVERVIEW

4.1 GENERAL

The ST-103 Transmitter generates an STS-1 frame signal with selectable payload and multiplexes this signal into an STS-3 frame. These signals are available as 3 bipolar DSX (STSX-1) front panel outputs, one rear panel set of binary ECL STS-1 Data, Clock and Sync and one OC-3 front panel signals. The outputs, controlled from a front panel LCD display and selection keys, and remotely via GPIB or RS-232C, may be timed from an internal or external clock. Access and manipulation of all TOH and POH bytes, including H1, H2 Pointer and K1, K2 APS, is provided. Controlled Error injection into selected portions of the output signal can be set. SPE and VT Stuff operations include stuff rates of programmable duration and occurrence.

The front panel controls consist of a Hex keypad, function keys, cursor positioning keys and a 14 line x 30 column LCD display.

4.2 TRANSMITTER FRONT PANEL

The ST-103 Transmitter front panel is divided into two control areas. The Menu area controls the Timing, Mode and Sonet functions, such as Pointer location, Scrambling and Error insertion. The data area controls data entry into the menus using the Hex keypad.

4.2.1 Controls

The controls cause Menus to appear on the LCD display allowing the user to access, set and modify various parameters. On each Menu, the presence of a second level menu is indicated by "..." at the end of a line. No Menu is greater than two levels deep.

ERROR
Provides access to Sub-menus for control of:
a) Parity Error in STS-1, STS-3, VTx
b) Overhead Bytes
c) Alarms
d) Pointer, STS-1 and VTx.

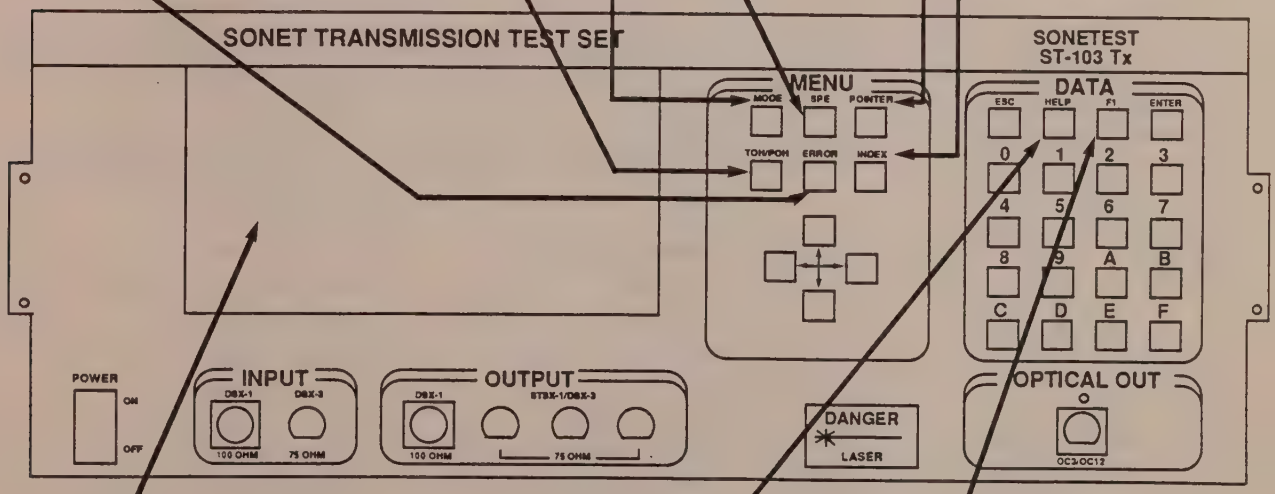
TOH/POH
Provides access to most TOH/POH bytes for modification and shows default state unless changed. B1, B2, B3, C1, H1, H2, H3 and H4 cannot be changed.

MODE
Allows selection of Timing, Scrambler, Optical Power On/Off, Remote Setup, LCD view angle and Options if any.

SPE
Provides selection of VT1.5 or DS3 Payload. Future enhancements will include VT2, FDDI and ISDN.

POINTER
Provides control of SPE and VT Pointers. Pstuff, Nstuff, Total Stuffs and Stuff rate are selectable. The current and new Pointer values are displayed.

INDEX
Allows operator to view Menu Directories as a tree structure providing quick, simple access to all features.



LCD DISPLAY:
14 line x 30 colum Double Supertwist LCD.

HELP
Provides access to Help Menu for each screen.

F1
Used to inject single errors and activate operations performed by the transmitter.

4.2.2 Display Menus

The main and sub-menus that are available to the user are listed here. Access, content and meaning of each menu is described in the Operating Instructions.

CONFIGURATION

MODE MENU

- VIEW ANGLE
- QUICK SETUP
- TIMING
- OUTPUT
  - OUTPUT SIGNAL
  - OUTPUT LEVEL
  - STS-1 SCRAMBLER
  - OPTICS
  - DSX1 LINE CODE
- PROGRAMMABLE SYNC
  - SELECT BYTE
- REMOTE SETUP
  - GPIB
  - RS232
- OPTIONS
- STORE/RECALL

SPE MENU

- VT1.5
  - VT1.5 MODE
  - CHANNEL
  - VT OH V5
  - PATTERN SOURCE
  - PATTERN TYPE
  - FRAME
  - PAYLOAD ENABLE
- DS3
  - DS3 SOURCE
  - PATTERN TYPE
  - FRAME
  - ALARMS
  - PAYLOAD ENABLE

POINTER MENU

- SPE POINTER
  - NEW POINTER
  - SINGLE
  - MODE
  - BURST COUNT
  - POLARITY
  - INTERVAL
  - RATE
- VT POINTER
  - NEW POINTER
  - SINGLE
  - MODE
  - BURST COUNT
  - POLARITY
  - INTERVAL
  - RATE
- SPE BURST
  - INIT TIME
  - MEASURE PERIOD
  - POLARITY
  - START TEST
- SPE PERIODIC ADD
  - INIT TIME
  - MEASURE PERIOD
  - INTERVAL
  - POLARITY
  - START TEST
- SPE PERIODIC CANCEL
  - INIT TIME
  - MEASURE PERIOD
  - INTERVAL
  - POLARITY
  - START TEST
- VT BURST
  - INIT TIME
  - MEASURE PERIOD
  - POLARITY
  - START TEST
- VT PERIODIC ADD
  - INIT TIME
  - MEASURE PERIOD
  - INTERVAL
  - POLARITY
  - START TEST
- VT PERIODIC CANCEL
  - INIT TIME
  - MEASURE PERIOD
  - INTERVAL
  - POLARITY
  - START TEST

TOH/POH MENU

ERROR MENU

- BIT/BPV ERROR
  - DS1 SINGLE BIT
  - DS3 SINGLE BIT/PAR
  - STSX-1 RANDOM RATE
- PARITY ERROR (STS-N)
  - STS-1 B1 SINGLE
  - STS-1 B2 SINGLE
  - STS-1 B3 SINGLE
  - STS-N RANDOM SINGLE
  - STS-N RANDOM RATE
- TOH/POH ERR
  - BYTE EDIT
  - MODE
  - ENABLE
  - COPY SETUP
- ALARMS
  - LOSS OF SIGNAL
  - FRAME LOSS A1/A2 BYTES
  - FRAME LOSS MODE
  - FRAME LOSS ENABLE
  - AIS TYPE
  - AIS MODE
  - AIS ENABLE
  - YELLOW TYPE
  - YELLOW MODE
  - YELLOW ENABLE
  - LINE FERF MODE
  - LINE FERF ENABLE
- APS TEST
  - INCONSISTENT MODE
  - K1/K2 BYTES
  - APS MODE
  - APS ENABLE
- POINTER (STS-1) ERROR
  - OUT OF RANGE
  - NDF ERROR
  - D BIT INVERT
  - I BIT INVERT
  - CONSECUTIVE NDF
- POINTER (VT1.5) ERROR
  - OUT OF RANGE
  - NDF ERROR
  - D BIT INVERT
  - I BIT INVERT
  - CONSECUTIVE NDF

4.3 TRANSMITTER REAR PANEL

4.3.1 Input/Outputs

STSX-1/DSX-3: Output, quantity 3, BNC, bipolar, STS-1 signal in SONET mode or DS3 from internal source in DS3 mode. Three outputs are identical in phase, amplitude and content, BNC jacks. B3ZS output coding. Output signals will adhere to eye diagram mask shapes and power level as given in TR-NWT-253. Output amplitude will be adjustable +/- 6 dB from nominal in 1 dB increments.

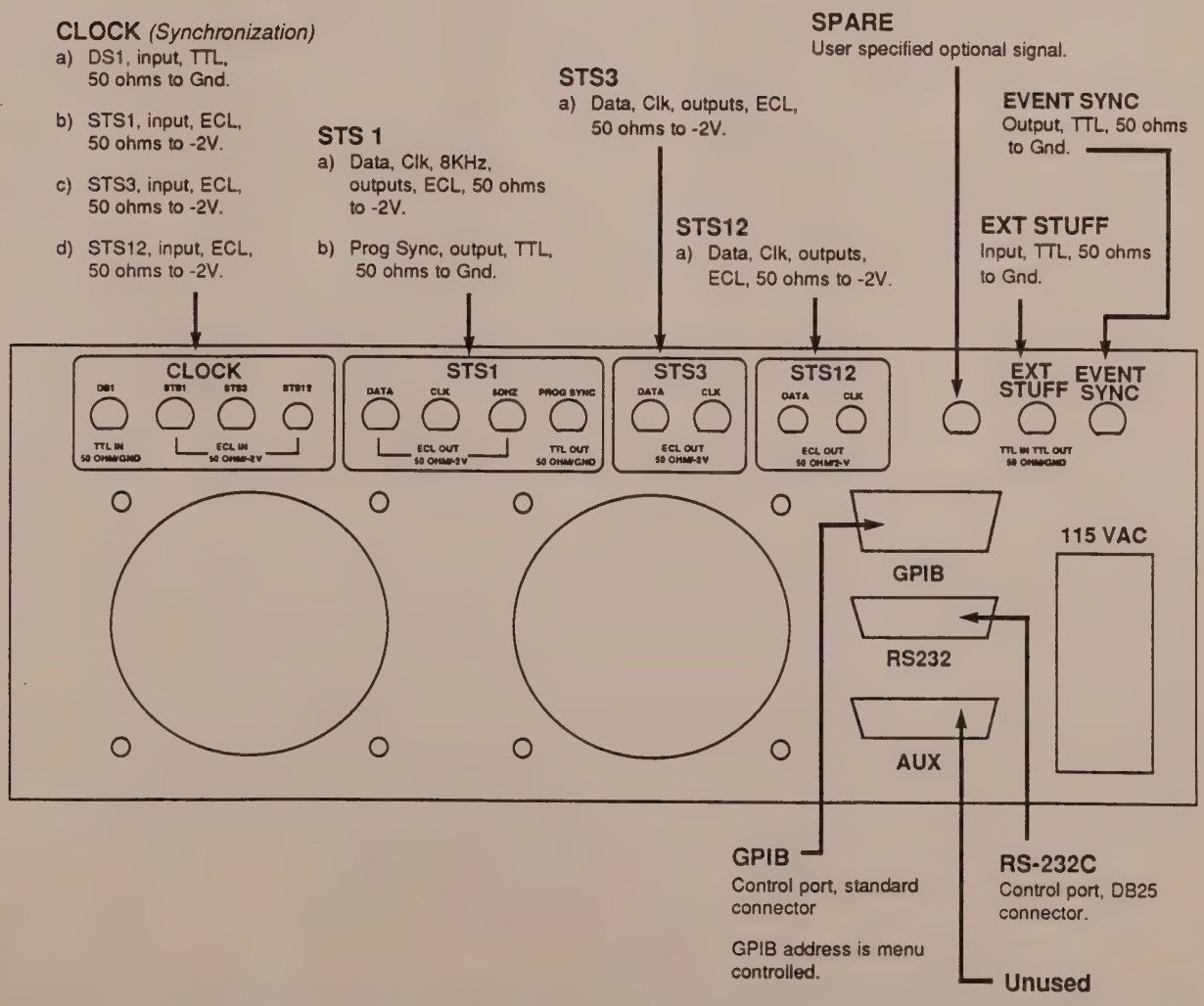
OC-3/OC-12: *(See also Sec. 17)* Output, quantity 1, Optical. When OC-12 option is installed, output can be either OC-3 or OC-12.

a) Laser source, 1310 nm wavelength
b) Power; -12 dBm min, -10 dBm typ, -7dBm max. Will meet the short reach requirements given in TR-NWT-253.
c) Connector, FC/PC

DSX-1: Output, quantity 1, accepts 310 plug, from internal source.

DSX-1: Input, quantity 1, accepts 310 plug, cross-connect level.

DSX-3: Input, quantity 1, BNC, cross-connect level.



TRANSMITTER OPERATING INSTRUCTIONS

For a clear understanding of the operation of the Transmitter, it is recommended that a Transmitter be at hand and operated in the sequence of the instructions.

5.1 POWER ON AND CURRENT CONFIGURATION

When the ST-103 Tx is initially powered on, several screens will appear identifying the model, type and software version. After those screens have appeared, a CURRENT CONFIGURATION screen appears. This screen is a synopsis of the transmitter's current set-up configuration. Besides appearing at initial turn-on, it can be accessed at any time by pressing the ESC button once from any upper level menu. The following is a description of each entry on the configuration screen.

5.1.1 OUTPUT:
The output signal rate shown is the currently active user selected output that allows injection of errors. For example, if STS-3 is shown then error injection will occur upon the OC3 and STS-3 outputs. The available options are STS-1, STS-3, STS-12 (if the STS-12/OC12 option is installed), DSX1, and DSX3. It should be noted that this selection does not select which outputs will be active except in the case of STSX1 and DSX3. If DSX3 is selected, the three BNC output jacks on the front will output three identical DSX-3 signals, otherwise it will output three identical STSX-1 signals. All other outputs are simultaneously active. Selection is made in the MODE... OUTPUT submenu.

5.1.2 OPTIC:
Indicates if the optical output is turned ON or OFF. Selection is made in the MODE...OUTPUT submenu.

5.1.3 SONET CLOCK SYNC:
Indicates which synchronization source is being used for the internal SONET clock. Available selections are: INTernal, EXTernal DSX1, EXTernal DS1CLK, EXTernal STS-1, EXTernal STS-3, and EXTernal STS-12 (when the STS-12/OC12 option is installed.) Selection is made in the MODE...TIMING submenu.

5.1.4 PAYLOAD CLOCK SYNC:
Indicates which synchronization source is being used for the internal Payload clock. Available selections are INTernal, SONET Clock, EXTernal DSX1, or EXTernal DS1CLK. SONET clock must be selected to allow pointer rate movement. Selection is made in the MODE...TIMING submenu.

5.1.5 STS-1 Scramble:
This selection indicates if the STS-1 frame synchronous scrambler is ON or OFF. The scrambler for STS-3 and STS-12 is always on. Selection is made in the MODE...OUTPUT submenu.

5.1.6 PAYLOAD:
This entry indicates the SONET payload type or DSX output type. Additionally, it shows the payload configuration. Selection is made from the SPE menu.

5.1.7 ACTIVE VT CHANNEL:
Indicates the user modifiable VT1.5 channel number (1-28.) The active channel is the one that VT pointer manipulation can occur on, it is also the channel to which an external DS1 signal can be mapped. This entry only has meaning when the selected payload is VT1.5. Selection is made from the SPE...VT1.5/DSX1 submenu.

5.1.8 POINTER:
Indicates the status of any SPE and/or VT pointer justification tests. Selection of a particular test is made from the POINTER menu.

5.1.9 SONET ALARM:
This entry shows the status of any transmitted SONET alarms. Status indications are shown for: FRAME LOSS TEST, AIS, YELLOW, and LINE FERF. Selection is made from the ERROR...ALARMS submenu.

5.1.10 APS:
Indicates the current value of both the K1 and K2 bytes in the Line Overhead. The value of the K1 and K2 bytes can be changed either in the TOH/POH menu, ERROR...TOH/POH submenu, or ERROR...APS TESTS submenu.

5.1.11 ERROR INJECT:
Indicates the current status of any BPV or PARITY error rates currently injected into an output as defined in the output section. Entry changes are affected by the ERROR menu.

5.2 HELP MENUS

Each menu item has extensive help associated with it. The HELP menu system is accessed as follows:

1) Select a menu by pushing the appropriate MENU button on the Transmitter front panel, or, select a submenu by pressing the ENTER key when the cursor is next to any item followed by ellipses.

2) Push the HELP button.

The help information will be displayed and, if larger than one screen, can be scrolled using the cursor keys.

3) Leave the HELP system by pushing the ESC button.

5.3 THE ST-103 MENU SYSTEM

The ST-103 transmitter has been designed for ease of use in selecting parameters for the signal that is to be transmitted. To do this, the various tasks have been divided into six different menus. Five of these menus select different categories while the sixth is a compilation of the other five.

The first five menus are MODE, SPE, POINTER, TOH/POH, and ERROR. These five categories comprise all of the various selectable parameters. The sixth, INDEX, is a single listing of all the entries in the first five menus. This INDEX menu is included for those that are not sure exactly which of the other five menus contain the particular item that is to be selected. It has all the entries of the other five menus strung together as a single menu.

The INDEX menu can be used to go to a particular menu item by pressing the ENTER key when the cursor is next to a desired function. The appropriate menu for this item will appear with the cursor located at the chosen line. The user can edit this or any other line in that menu. If ESC is pressed the INDEX menu reappears with the cursor at the point from which it exited.

Alternatively, each menu can be selected simply by pushing the corresponding front panel menu key. Use the up/dn arrow keys to select an item. If the item contains an editable parameter it will be identified by an inverse video box (black box with white lettering.) If the item indicates a submenu (such as STS-1 Programmable sync... in the MODE menu) it will be followed by ellipses. Submenus are entered by pressing the ENTER key next to these items. Push the ESC key to back out one level from any menu or submenu.

While in a top level menu, the current transmitter configuration screen appears when the ESC key is pressed. Additional information will appear on the screen to alert the user of an illegal operation when necessary.

If data (hex or decimal) is to be entered, use the front panel data keypad to enter it. For decimal entries use 0-9, for hex use 0-9 and A-F. When parameters have been changed or data has been altered, the lower left portion of the screen will flash "ENTER" in inverse video. Parameters will not change until ENTER is pressed. Pressing ESC will exit the menu without changing entries.

Depending on the output and payload configurations selected, certain combinations of selections will not be available. These will be indicated either by selections not appearing on the screen, not allowing you to choose certain selections, or warning messages will appear with information regarding the proposed selections.

5.4 MODE MENU

This menu primarily is used for initial and one-time setup of configuration information. Use the up/down and left/right arrow keys to select.

5.4.1 VIEW ANGLE submenu

This feature allows adjustment of the LCD view angle. There are 16 selection values from 0 to 15. Use the < > arrow keys to change selection. Pressing the ENTER key after modification will store the current value into the ST103's non-volatile memory.

5.4.2 QUICK SETUP submenu

There are 9 different factory defined system setups for an OC12 optioned unit (7 for an OC3 configured unit.) These setups are used to quickly set the system into a known operational state without having to search through menus. These setups are defined in Appendix B. In general, all error and alarm conditions are turned off. Use the arrow keys to select a setup and then press the ENTER key. The current configuration will appear after the unit is reconfigured. The MASTER DEFAULT selection returns the unit to the state it was in upon shipment.

5.4.3 TIMING submenu

This submenu controls the internal clock synchronization with both internal and external timing signals. The internal clock sources are shown on the right side of the screen while the external timing source input selections are on the left. Connecting internal and external sources together is accomplished using switches to "close" or "open" the various timing paths. The switches are denoted by small circles in the matrix. Selection of a switch is accomplished using the arrow keys. Selection of a particular path is accomplished using the F1 key to toggle the switch.

The DSX-1 input is the DSX-1 input on the front panel. The DS1 and three STS clock inputs are on the rear panel.

The "!! SYNCHRONIZATION LOSS" message may appear at the bottom of the display while the chosen source is acquiring sync. Upon termination of the message a new data flag will be sent with a valid SONET output. The transmitter will not operate properly while this message is present. If an external synchronization source is selected, and is not present, the warning will appear.

5.4.4 OUTPUT submenu

5.4.4.1 SIGNAL:

The selected output rate is the one that will be used to properly scale error injection rates. The available options are STS-1, STS-3, STS-12 (if the STS-12/OC12 option is installed), DSX1 and DSX3. It should be noted that this selection does not select which outputs will be active except in the case of STSX1 and DSX3. If DSX3 is selected, the three BNC output jacks on the front will output three identical DSX-3 signals, otherwise it will output three identical STSX-1 signals. All outputs are simultaneously active.

5.4.4.2 DSX3/STSX1 OUTPUT LEVEL:

This selection allows varying the output level +/- 6 dB from a nominal 0dB output level in 1dB increments. This adjustment only affects the front panel DSX outputs.

5.4.4.3 STS-1 SCRAMBLER:

Allows selection of the scrambler to be ON or OFF for the STS-1 level.

5.4.4.4 OPTICS:

Allows selection of the optical output to be ON or OFF. Note that the optics can be turned ON only when the OUTPUT SIGNAL is selected as STS-3 or STS-12 (if the OC12 option is installed). Note that the red indicator lamp above the OPTICAL OUTPUT jack will illuminate when this selection is ON.

5.4.4.5 DSX1 LINE CODE:

Selection of either AMI or B8ZS line codes for the DSX-1 output can be selected.

5.4.5 STS-1 PROGRAMMABLE SYNC submenu:

The PROGRAMMABLE SYNC feature allows for selecting the time coincident positioning of a single byte wide pulse with any byte in the STS-1 frame. The PROGRAMMABLE SYNC screen displays a selection of TOH and POH bytes that can be selected, or alternatively, any payload byte by its offset from the J1 byte.

Use the arrow keys to select the TOH/POH byte directly, or select OFFSET FROM J1 and enter the byte number (0-782). The STS-1 output is on the rear panel, as is the PROGRAM SYNC jack that outputs the pulse. The output pulse at the jack is one byte wide and is time aligned with it.

5.4.6 REMOTE submenu

This submenu allows setup of the GPIB and RS232 parameters. The GPIB selections control GPIB ADDRESS and TERMINATOR. The RS232 selections control BAUD rate, PARITY, CHARacter SIZE (7 or 8 bits), EOL end of line terminator, XON/XOFF flow control, and ECHO which will determine if the ST-103 transmitter will echo any commands sent to it.

5.4.7 OPTIONS submenu

This submenu indicates what options are installed in the ST103 transmitter.

5.4.8 STORE/RECALL submenu

This function is similar to the QUICK SETUP discussed earlier. The difference is that these 10 setups are user definable. To use this function, first set up the transmitter the way you want it for your test. Then select the STORE/RECALL function.

1) Use the up/dn arrow keys to select in which location you want to save the setup.

2) Use the < > arrows to select the EDIT function and then press the ENTER key.

3) Use the up/dn arrow keys to scroll through all the letter and number combinations and the < > keys to select the character position to give the test a unique name of your choice.

4) When the name is complete, press the ENTER key.

5) Use the < > arrow keys to select STORE and then press the ENTER key.

This sequence STORES a complete test set-up configuration. Existing configurations can be changed by using the same procedures as described above to overwrite an existing configuration.

To use a stored configuration, select the test as described in step 1) above. Select RECALL rather than EDIT using step 2) above. The selected configuration is now active.

5.5 SPE MENU

This menu selects the type of Payload that will be mapped into the SONET signal.

5.5.1 VT1.5 / DSX1 submenu

5.5.1.1 VT1.5:
Use the < > arrow keys to select either LOCKED or FLOATING modes.

5.5.1.2 CHANNEL:
Which of the 28 VT1.5 channels that contains the user definable DS1 pattern. The remaining 27 background channels will contain uniquely numbered, D4 framed, 24 bit words generated by the ST-103 transmitter which can be identified by the VT1.5 Channel Scan feature of the ST-103 Receiver.

5.5.1.3 VT OH V5:
Allows modification of bits in the V5 byte of the active channel.

5.5.1.4 PATTERN:
This selects the source of the active channel payload. It can either be internally generated, or an externally supplied DSX-1 into the DSX-1 input jack on the front panel.

If the pattern is INTERNAL, pattern selection is provided. The choices are a user settable 24 bit pattern, four PRBS sequences, and a QRW pattern. The difference between the QRW and PRBS sequences is that the QRW pattern contains the necessary zero suppression for DS1 signals.

5.5.1.5 FRAMING:
The choices are either UNFRAMED or D4 framing.

5.5.1.6 PAYLOAD ENABLE:
Once the payload is setup it must be enabled. To enable this payload move the cursor to the payload enable line and press the F1 key. Once enabled, the word ACTIVE along with an indicator will appear at the bottom of the screen. NOTE: Only one type of payload can be active at a time. If the DS3 payload was active, activating the VT1.5 payload will automatically deactivate the DS3 payload.

5.5.2 DS3 / DSX3 submenu

5.5.2.1 DS3 PAYLOAD:
This selects the source of the active channel payload. It can either be internally generated, or an externally supplied DSX-3 into the DSX-3 input jack on the front panel.

If the pattern is INTERNAL, pattern selections are provided. Either a 2^{15}-1 pseudorandom sequence or user programmable 8 bit word can be programmed. Note that the programmable word can be edited even though the PRBS pattern is selected.

5.5.2.2 FRAMING:
The choices are M13, CBIT, or UNFRAMED.

5.5.2.3 ALARMS:
If M13 or CBIT framing is selected, then either X-BIT, AIS, or IDLE alarms can be turned on or off.

5.5.2.4 PAYLOAD ENABLE:
Once the payload is setup it must be enabled. Select this option and then press the F1 key. Once enabled, the word ACTIVE along with an indicator will appear at the bottom of the screen. NOTE: Only one type of payload can be active at a time. If the VT1.5 payload was active, activating the DS3 payload will automatically deactivate the VT1.5 payload.

5.7 TOH/POH MENU

Unlike the previous menus which allowed only legal changes and configurations, the TOH/POH menu will allow changes and configurations that are considered abnormal and may cause faults and abnormal operation of the equipment it is connected to. Care should be exercised in setting any configuration that will cause adverse system reactions.

This menu consists of a single screen containing the master Transport and Path Overhead (TOH/POH) that is transmitted with the mapped-in payload. All 36 bytes are displayed and editable except for B1, B2, and B3 which are parity bytes that are calculated and inserted by the transmitter. H1, H2, H3, and H4 bytes which are pointer, stuff, and indicator bytes that are also determined and inserted by the transmitter. The C1 STS-1 D byte also cannot be edited.

1) Use the arrow keys to select the byte to be edited.

2) Use the data entry keys to change the data (hex).

3) Push the ENTER key when all changes are complete. The changes take effect only after the ENTER key has been pushed.

To return all TOH/POH entries to the factory default, use the dn arrow key to select COPY DEFAULT and push the C key in the data entry area.

5.8 ERROR MENU

In this menu there are several different error rates that can be activated. It must be noted that only one error rate can be activated at a time. Upon activation of any rate error inject, any other previously activated error injects will be automatically shut off. Single error injects can be activated simultaneously with a rate error inject.

5.8.1 BIT/BPV (PAYLOAD & DSX) submenu

5.8.1.1 DS1 BIT single error:
Selecting this and pushing F1 injects a single DS1 bit error into the DSX-1 output and payload, before mapping.

5.8.1.2 DS3 BIT/PAR single error:
Selecting this and pushing F1 injects a single DS3 bit/parity error in the DSX-3 output or payload, before mapping.

5.8.1.4 STSX-1 RANDOM (BIT/BPV):
STSX-1 BIT/BPV errors will be injected at a controlled rate. Errors are injected as logical bit inversions after B3ZS encoding. The rate limits are $1x10^{-3}$ to $1x10^{-9}$. To activate this function, use the an arrow key to select RATE and enter the rate exponent (3-9), then push F1.

5.8.2 PARITY ERRORS (STS-N) submenu

5.8.2.1 STS-1 single error:
Selecting this function and pushing F1 will cause a single STS-1 B1, B2, or B3 parity error only. A single bit in the parity byte is inverted before it is inserted into the STS-1 data stream. If an output signal rate other than STS-1 is currently active a single STS-1 B1 error will have no effect. However, if the STS-3 or STS-12 output rate is active, then pressing the F1 key while the B2 or B3 selection is valid (as determined by the inverse video box) will cause a single B2 or B3 error on all constituent STS-1 channels.

5.8.2.2 STS-1 RANDOM single error:
Selecting this function and pushing F1 will cause a single random error in the STS-N output, where N is 1, 3, or 12 depending on the selected output signal rate. This error will occur randomly in the output signal. In addition, if STS-3 or STS-12 is selected, a single error can be programmed to occur on a selected channel as determined by the C1 id byte in the transport overhead. This feature is useful to identify a channel at the transmit end and compare with expected channel errors on the receive end.

5.8.2.3 STS-N RATE RANDOM ERRORS:
The same as the single error listed above except that errors will be injected at a controlled rate. The rate limits are $1x10^{-3}$ to $1x10^{-9}$. To activate this function, use the down arrow key to select RATE and enter the rate exponent (3-9), and push F1. If STS-3 or STS-12 is selected, the error will appear in the STS-N data stream.

5.8.3 TOH/POH submenu

This menu is very similar to the TOH/POH menu described in Section 5.7. It differs in its functionality and usage. This menu allows TOH/POH overhead to be changed temporarily for a predetermined number of frames, or continuously. Note that this function cannot be activated in conjunction with any other alarm or APS testing.

5.6 POINTER MENU

The pointer menu offers control of pointer manipulation sequences for the SPE and VT1.5 pointers.

5.6.1 SPE POINTER submenu

5.6.1.1 CURRENT SPE POINTER:
This shows the current SPE pointer value.

5.6.1.2 NEW POINTER (NDF):
This field allows pointer jumps accompanied by a new data flag. Entries in the range of 0-782 are accepted. Press the F1 key to execute the operation.

5.6.1.3 SINGLE:
This allows a single positive or negative pointer justification. Each time the 0 (negative) or 1 (positive) data input key is pressed, a justification takes place.

5.6.1.4 PJ MODE:
Select either BURST or CONTINUOUS. Burst, and its associated count is the number of justifications before the automatic rate turns itself off. CONTINUOUS will not turn off automatically. Note that the timing configuration (from the MODE...TIMING submenu) must set the payload clock sync to the SONET clock. Pointer adjustment rates are only allowed for internal payloads. An error message to allow automatic configuration will appear if improper timing modes are enabled.

5.6.1.5 PJ POLARITY:
Select the PJ polarity for rate justifications. EXT is a TTL 50 ohms to ground input on the rear panel (EXT STUFF) that can change the justification polarity. A low causes a negative justification at the next stuff opportunity as defined by the PJ rate. A high, a positive justification. The input is latched during the B1 byte position of the STS-1 and requires a minimum 100 nano seconds of setup and hold time.

5.6.1.6 PJ INTERVAL:
This selects how many frame intervals between justifications. The allowable values are 3 to 131071.

5.6.1.7 PJ RATE:
Select this and use the F1 key to activate the selected PJ RATE.

5.6.2 VT POINTER submenu

This menu contains exactly the same options as the SPE POINTER described in Section 5.6.1 above except that the change is in the VT rather than the SPE. The only differences are the NEW POINTER range is 0 to 103, there is no EXT selection for the PJ POLARITY and the range for the PJ INTERVAL is 2 to 65535.

5.6.3 POINTER SEQUENCE submenus

5.6.3.1 SPE BURST or VT BURST:
This test provides for a series of burst type PJ's over a controlled period of time. A total of three stuffs are performed, separated by 4 frames (or multiframes for VT) each measurement period.

5.6.3.2 INITIALIZATION TIME:
Sets the initialization period prior to any pointer justification. Range is 1 to 999 seconds. The default is 60 seconds.

5.6.3.3 MEASUREMENT PERIOD:
This is the time between the beginning of adjacent PJ change bursts. Range is 1 to 999 seconds. The default is 30 seconds.

5.6.3.4 PJ POLARITY:
This sets the PJ polarity. They can be POSitive, NEGative, or EXTernally controlled. See PJ POLARITY under SPE POINTER above. NOTE that there is no EXTernal PJ POLARITY for VT BURST.

5.6.3.5 K:
This sets the number of periods in the test. Range is 1 to 9999 periods.

5.6.3.6 TEST:
This enables the test sequence. Use the F1 key to toggle the test ON or OFF. When the test is completed, the inverse video "ON" changes to "OFF".

5.6.4 SPE or VT PERIODIC ADD or CANCEL submenus

This test provides for a series of periodic add type PJ's over a controlled period of time. At each measurement period boundary, a stuff is added or cancelled.

The test parameters are identical to the SPE/VT BURST sequence described above except that the allowable value for the PJ INTERVAL is 1 to 16383 milliseconds for the SPE PERIODIC ADD and CANCEL. The allowable value for the PJ INTERVAL is 1 to 32767 milliseconds for the VT PERIODIC ADD and CANCEL.

It is set up identically to the previously discussed TOH/POH menu. Ideally it should initially contain identical data to the first TOH/POH menu before editing. To accomplish this, do the following:

1) Use the down arrow key to select COPY FROM TOH/POH SETUP and push C and then ENTER on the data entry keypad.

2) Use the arrow keys to edit the TOH/POH ERROR MENU. This is done identically to the earlier discussed menu.

3) Use the down arrow key to select MODE.

4) Use the < > keys to select BURST or CONTINUOUS.

5) If BURST is selected, use the down arrow key and the number keys on the data entry pad to select the number of frames that this modified TOH/POH overhead is to be in effect.

6) If CONTINUOUS is selected, use the down arrow key to allow for activation.

7) Push F1 to activate.

5.8.4 ALARMS submenu

Each of the following ALARM error tests must be used separately. They cannot be enabled concurrently or in conjunction with TOH/POH or APS tests.

5.8.4.1 LOSS OF SIGNAL:
Will cause loss of signal for 0 to 150 microseconds. Select LOSS OF SIGNAL with the up/dn keys, enter the duration and press F1. Loss of signal cannot be operated in conjunction with SPE pointer rate testing.

5.8.4.2 FRAME LOSS TEST:
Will cause loss of STS-N frame by changing the value of the A1 and/or A2 bytes.

1) Select FRAME LOSS TEST using the up/dn arrow keys.

2) Use the < > keys and the data entry keys to select the values of A1 and A2.

3) Use the down arrow key to select BURST or CONTINUOUS.

4) Use the down arrow key and data entry keys to select the number of test frames if BURST has been selected.

5) Press F1 to activate. If another ALARM is already active, the first press of F1 will deactivate the first ALARM. The second press will activate the selected one.

5.8.4.3 AIS:
Selects the type of AIS alarm. Selected similar to that above. Select LINE, PATH, or VT PATH and BURST or CONTINUOUS

5.8.4.4 YELLOW:
Selects the type of YELLOW alarm. Select STS PATH or VT PATH, BURST or CONTINUOUS.

5.8.4.5 LINE FERF:
Selects Far End Receive Failure. Select BURST or CONTINUOUS.

5.8.5 APS TESTS submenu
These tests are used to verify Automatic Protection Switching. These tests cannot be used in conjunction with the TOH/POH or ALARM tests.

5.8.5.1 INCONSISTENT BYTE FAIL MODE:
This controls the APS Inconsistent byte failure mode. When set to OFF, the transmitter will output the K1 and K2 bytes as set in the TOH/POH menu discussed earlier. When set to ON, the K1 and K2 bytes will toggle between those in the TOH/POH menu and those set in this menu. Use the < > keys to select ON or OFF, press ENTER.

5.8.5.2 APS BYTES:
Allows selection of the parameters for APS testing.

1) Select the K1 and K2 byte values for the INCONSISTENT BYTE FAIL MODE. Use the < > arrow keys and the data entry keys to set the values. Push ENTER.

2) Select BURST, CONTINUOUS, or TIMED using the down arrow key.

3) Use the down arrow key and data entry number keys to select the number of BURST frames or number of seconds for the timed test. Press ENTER.

4) Use the down arrow key and the F1 keys to activate this function.

5.8.6 POINTER ERRORS (STS-1) submenu

5.8.6.1 CURRENT SPE PTR:
This shows the current pointer value.

5.8.6.2 OUT OF RANGE PTR:
This sets a new SPE pointer value that is out of range of normal pointer values. This function's range is 783 to 1023. This pointer value is transmitted with a new data flag but the current SPE position does not move. The previous pointer value is restored with a new data flag operation upon exiting this function. This function is exited by using the up/down or any menu key. Use the data key pad to set the value. Activate by pressing F1.

5.8.6.3 NDF:
This function allows independent control of the NDF value contained in the H1 pointer byte along with a new pointer value. Normally the first four bits of the H1 byte are 1001 if a new pointer value is being sent, and 0110 if one is not. Provides independent control over both pointer value and sending NDF. Use the < > keys to set the values and activate with F1.

5.8.6.4 MAJORITY VOTE TEST:
Use the up/down keys to select either D or I bits. This function tests the three out of five majority vote rule for SPE pointer processing of D and I bits of the STS-1 H1 and H2 pointer word. Use the up/down arrow keys to select D or I bits, use the data key pad to set the bits, and press F1 to activate.

If three out of the five D bits are inverted, then a negative justification is performed. Otherwise the selected bit(s) are inverted for a single frame without moving the SPE location. A 1 indicates a desired logical inversion of a bit, a 0 is not inverted. The display shows the I or D bits in descending order from left to right.

The same holds true for the I bits except that a positive justification will take place.

5.8.6.5 CONSECUTIVE NDF TEST:
This function controls the continuous output of NDFs with the SPE pointer that is set. Use the down arrow key to select NEW POINTER. Use the data key pad to enter the new pointer value and activate with F1. This function is automatically ended upon pushing F1 again, or exiting the menu.

5.8.7 POINTER ERRORS (VT1.5) submenu

This menu and its functions are identical to those in the STS-1 menu in Section 5.8.6 above. The difference is that the OUT OF RANGE PTR values are 104 to 1023 for the V1, and V2 pointer words. VT pointer erroring only occurs on the active channel.

5.9 INDEX

The INDEX menu is a compilation of the five preceding menus. This menu is useful for sequentially setting up the transmitter by accessing each function, or for finding a menu function. Select this menu by pushing the INDEX menu key and scrolling through it using the arrow keys. Pushing the ENTER key will bring up the menu and function that is highlighted.

5.10 EXAMPLE SETUP

As an example, assume a requirement to transmit a SONET signal with the following characteristics:

5.10.1 SETUP CRITERIA
Optical at the OC3 rate.

Internally generated Floating VT1.5 payload with the test signal on Channel 6.

Both the Payload and SONET clocks will be internally supplied with the Payload clock synchronous with the SONET clock.

Standard TOH/POH overhead is to be used.

5.10.2 THE TRANSMITTER SETUP
Using the criteria in section 5.10.1, here is the sequence that should be used to set up the transmitter (other than using either the QUICK SETUP or STORE/RECALL functions):

5.10.2.1 MASTER DEFAULT

1) To be sure of the starting point, set the transmitter to the MASTER DEFAULT.
2) Enter the MODE MENU and use the arrow keys to select QUICK SETUP.
3) Push the ENTER button.
4) Use the arrow keys to select MASTER DEFAULT and push the ENTER key.

5.10.2.1 MASTER DEFAULT

The transmitter is now set to the Factory Default settings.

5) Enter the MODE MENU and select VIEW ANGLE.

6) Use the < and > arrows to adjust for best viewing.

5.10.2.2 MENU SELECTION AND SETUP

1) First set up the payload by entering the SPE menu.

2) Select VT1.5/DSX1 and push ENTER.

3) Since the payload is FLOATING, select FLOATING on the first line of the menu.

4) Set CHANNEL to 6.

5) Set the PATTERN to INTERNAL.

6) Set the PATTERN to one of the six choices, and the FRAMING to be either UNFRAMED or D4. If the 24 BIT word is selected, set the six HEX values to the proper values.

7) Select PAYLOAD ENABLE and push F1. The word ACTIVE appears.

8) Next enter the MODE menu.

9) Select TIMING and push ENTER.

10) Use the arrow keys to select the lower right switch. Use the F1 key to toggle it so that it is pointing up and not connected to any of the connections.

11) Use the up arrow key to select the upper right switch. Push F1 until the switch points downward and connects to the SONET clock. These two selections will provide an internally timed clock with the PAYLOAD synchronous to the SONET clock, which is asynchronous to the system under test.

12) Select the MODE menu again or press ESC to move up one menu level, then select OUT PUT. Push the ENTER key.

13) Select the SIGNAL to be STS-3.

14) Set the OPTICS to ON. Note that the indicator over the OPTICAL OUT jack comes on.

15) When all selections are made, push the ENTER key.

This completes the setup to meet the listed criteria. POINTER, ERROR, and other selections can be adjusted depending on test requirements. Variations from the above criteria would be set up in a similar sequence. All of the above operations are performed when the user selects the OC3-VT1.5 quick setup with the exception of payload clock timing.

SECTION 6.0

TRANSMITTER RS-232C INTERFACE APPLICATION INFORMATION

6.1 REMOTE INTERFACE CAPABILITIES

The ST-103 supports remote control through the RS-232C interface bus connector on the rear panel. The unit can be operated from the front panel and over the remote interface simultaneously, any unit status changes made remotely will be displayed on the front panel. All of the front panel functions can be controlled over the RS-232C interface bus except 'POWER'.

The remote commands sent to the ST-103 differ from front panel control. The current operating mode is entered directly rather than through sub-menus.

6.2 INTERFACE DEVICE SETTINGS

The RS-232C interface device settings are programmable through the front panel. The following RS-232C parameters are programmable, along with the possible selections and the default setting in parentheses:

PARAMETER	(DEFAULT)	VALUES
■ BAUD RATE	: (9600)	2400, 1200, 300
■ PARITY	: (EVEN)	NONE, ODD
■ DATA SIZE	: (8)	7
■ EOL	: (CR/LF)	LF/CR, CR, LF
■ XON/XOFF	: (OFF)	ON
■ ECHO	: (ON)	OFF

To change an RS-232C setting through the front panel,

Step 1 : Press MODE,

Step 2 : Select the REMOTE menu choice,

Step 3 : Select the desired settings,

Step 4 : Press ENTER.

6.3 INTERFACE HARDWARE/ HANDSHAKING CONSIDERATIONS

The remote interface consists of a 25 pin female D-type connector located on the rear panel. When using the RS-232C remote interface, connect the controller to the ST-103 rear-panel connector with an appropriate 25 pin cable.

The ST-103 is configured as an RS-232C Data Circuit terminating Equipment (DCE). For a local (direct) connection to a DTE device (most RS-232C controllers), connect the controller to the ST-103 with a straight (non-null modem) cable.

To interface to another DCE device, a null modem is required to cross-connect signal pairs (2 & 3, 4 & 5, and 6 & 20). Refer to Table A.1 for RS-232C signal names, pinouts and functional descriptions.

Table A.1 RS-232C Interface Connector Pin-out

PIN	NAME	FUNCTION
1	GND	Protective Ground.
2	RxD	Received Data Input. Data sent to the ST-103 is received on this input.
3	TxD	Transmitted Data Output. Data sent from the ST-103 to the terminal is transmitted on this pin.
4	CTS	Clear to Send. Sent to the ST-103, a hi-level indicates that external device is ready to accept data from the unit. This pin must be high or open for the ST-103 to transmit Data. This pin is pulled high internally by 27K ohm to +12V.
5	RTS	Request to Send. Always High.
6	DTR	Data terminal Ready. Always high.
7	GND	Signal Ground.
20	DSR	Data Set Ready. Ignored

ALL OTHER PINS Not used.

6.4 INTERFACE TESTING

To test that the RS-232C interface is properly connected, attach a standard 25 pin D-type connector cable between the ST-103 RS-232C rear panel connector and the controller, with the ST-103 off.Turn on the ST-103. The following message should appear on the RS-232C controller's screen, followed by the prompt "ST103> ":

***** MICROWAVE LOGIC ST-103 TX V1.1 10/91 *****
ST103>

If the message does not appear, check the following:

1) The cable may be defective,
2) The controller may be configured as DCE equipment. A null modem may be required,
3) The controller signal format, or Baud rate may not match the ST-103's settings. Refer to the previous section "RS-232C INTERFACE DEVICE SETTINGS" for interface setting information.

6.5 PROGRAMMING REMOTE COMMANDS

There are two types of remote commands for the ST-103:

1) set commands (or commands) and,
2) queries commands (or queries).

The set commands force the ST-103 to take a specific action. The query commands direct the ST-103 to return status information.

Commands are entered one line at a time. Errors may be corrected while entering a line, with the backspace key. A command string is terminated by a carriage return, which transmits the string to the ST-103 and executes the command string. All valid commands are executed, incorrect or unsupported commands are responded to by an error message. Refer to the following section "RS-232C ERROR MESSAGES" for RS-232C error messages.

Command lines may contain a single command or multiple commands. The command line may contain both queries and commands. Individual commands within the command line must be separated by semicolons (;), parameters must be separated by commas (,). Non-decimal numeric parameters, Hexadecimal, Octal, and Binary, must be preceded by a '#H', '#Q', or '#B', respectively. Refer to the following section "RS-232C COMMAND EXAMPLES" for command line examples.

The entire command name does not have to be entered for the command to be recognized as valid. There is a minimum valid length associated with each command,which is the length that makes it unique from all other commands listed below.

Refer to Appendix A for ST-103 Tx commands.

6.6 ERROR MESSAGES

All RS-232C remote commands received by the ST-103 are checked for command validity, and appropriate parameters (parameters listed with commands within brackets [ ]). All valid command strings are executed, incorrect command strings are responded to with error messages.

ERROR MESSAGE	ERROR
"*** Input Lost"	Input data lost over interface.
"*** Input Buffer Overflow"	Input buffer overflow, command line too long without terminator.
"*** Command Mnemonic Not Found"	Command not found.
*** Invalid Command For Interface"	Command found, but not valid for this interface.
"*** Invalid Command Type"	Command mnemonic found, but command issued incorrectly: missing, or added, '?' on end of command.
"*** Too Few Parameters"	Missing parameter.
"*** Too Many Parameters"	Too many parameters or trailing garbage at end of command.
"*** Invalid Parameter"	Parameter invalid.
"*** Parameter Out of Range"	Parameter out of range.

SECTION 6.6 (CONT)

ERROR MESSAGE	ERROR
"*** Parameter Not in Set"	Parameter not one of the values specified for the command.
"*** Invalid String Length"	Parameter string too long.
*** Parameter Separator"	Parameter separator, ';', is missing or command line is terminated following separator.
"*** Invalid Non-decimal Parameter"	Parameter not in a valid non-decimal format, or parameter out of the 0 to 255 decimal range.
"***Command Execution Error"	Command not executed properly or command attempted to put the ST-103 into an invalid state.
"***Out of Memory"	Processor out of Memory.

6.7 COMMAND EXAMPLES

COMMAND	RESPONSE
view_angle?	Returns the current Front Panel view angle.
view_angle 3	Sets the front panel LCD view angle to angle '3'.
rs_prompt 'ST-103> '	Sets the prompt to 'ST-103> '.

TRANSMITTER GPIB INTERFACE APPLICATION INFORMATION

7.1 REMOTE INTERFACE CAPABILITIES

The ST-103 supports remote control through the GPIB interface bus connector on the rear panel. The unit can be operated from the front panel and over the remote interface simultaneously. Any unit status changes made remotely will be displayed on the front panel. All of the front panel functions can be controlled over the GPIB interface bus except 'POWER'.

The remote commands sent to the ST-103 differ from front panel control. The current operating mode is entered directly rather than through sub-menus.

7.2 INTERFACE DEVICE SETTINGS

For proper GPIB Interface communication and hand-shaking, the GPIB controller (Computer or other controller), and the Device (ST-103 Tx), must have their addresses set up prior to use.

Each instrument on the GPIB interface bus must have a unique INSTRUMENT address. The INSTRUMENT address range for the ST-103 (0 TO 30 decimal) is set in the REMOTE sub-menu under the MODE menu.

The ST-103 will then respond to commands sent to that INSTRUMENT address. This will be done without affecting the remote command processing.

7.3 INTERFACE FUNCTIONS

The ST-103 is configured as a talker/listener. No controller functions are implemented. As described in the IEEE-488 GPIB standards the ST-103 supports the following implementation:

SH1	Complete source handshake.
AH1	Complete acceptor handshake.
T6	Basic talker, serial poll, no talk only, unaddressed if addressed to listen, no extended talker.
L4	Basic listener, no listen only, unaddressed if addressed to talk, no extended listener.
SR1	Complete service request.
RL1	Complete remote/local capability including local lockout.
PP0	No parallel poll capability.
DC1	Complete device clear capability.
DT0	No device trigger capability.
C0	No controller capability.
E2	Tri-state drivers used on DI0 lines for maximum data transfer rate.

7.4 INTERFACE CONNECTOR

The ST-103 Tx uses the standard D-type 24 pin GPIB connector located on the rear panel. All signals and pins conform to standard GPIB pin out protocol.

7.5 PROGRAMMING GPIB REMOTE COMMANDS

There are two types of remote commands for the ST-103:

1) set commands (or commands) and,

2) queries commands (or queries).

The set commands force the ST-103 to take a specific action. The query commands direct the ST-103 to return status information.

The controller sends commands to the ST-103 as strings terminated by EOI or EOI/LF character. These command lines can contain a single command or multiple commands. The command line may contain both queries and commands. Each individual command within the command line must be separated by semi-colons (;), parameters must be separated by commas (,). HEXadecimal parameters must be preceeded by a '#H'.

Refer to the "COMMAND EXAMPLES" section for command line examples.

Each query command sent to the ST-103 will return one response. The response may contain multiple response units (separated by semi-colons), however only one EOI/LF response termination is sent by the ST-103 to the controller for each query command.

The responses for the ST-103 commands will be either character mnemonics (Example: INT or EXT) or numerics (Example: 14). Appendix A lists all queries and specifies the query response format the command will return. If the query returns a mnemonic, the valid mnemonic will be listed.

7.6 NUMERIC RESPONSES

If the query responds with a numeric, it will be specified as one of the following types:

1) <NR1 Numeric> -decimal integer
2) <NR2 Numeric> -decimal real number without exponent
3) <NR3 Numeric> -decimal real number with exponent
4) <Non-decimal Numeric> - non-decimal number with leading '#H' (Hex), '#Q' (Octal), or '#B' (Binary) and always in the range of 0 to 255 decimal.

A list of the GPIB commands is provided, along with a brief description of each command, the valid parameters, and the basic response format. The parameters shown within brackets '[ ]' following the command name are required.

7.7 STATUS REPORTING

There is status reporting functionality provided for the GPIB interface, which is based on the service request (SRQ) and is fully defined in the ANSI/IEEE standard 488.2-1987.

STATUS BYTE

There is a status byte which is used to determine the SRQ status. The individual bits within the status byte represent the different conditions which might cause the request for service, defined as follows:

Bits 1 to 4: Unused
Bit 5 : (MAV) Message Available Bit
Bit 6 : (ESB) Standard Event Status Bit
Bit 7 : (MSS) Master Summary Status Bit
Bit 8 : Unused

Message Available Bit -Set whenever there is output available for the controller.

Standard Event Status Bit - This is the summary of the Standard Event Status Byte. It will be set whenever an enabled standard event condition occurs.

Master Summary Status Bit - This is the Master Summary Status. It is a summary of the status byte, so that when ever one of the bits (MAV or ESB) is set and it is also enabled by the Service Request Enable byte), the MSS bit will be set.

SERVICE REQUEST ENABLE

The different conditions for a service request can be individually enabled. The Service Request Enable byte contains the enabling bits for the status byte. For a service request to occur, either the MAV or ESB bit must be enabled. Each time the ST-103 is powered on, this byte is RESET so that no bits are enabled. The bit definition is the same as the status byte, except bit 7 is undefined.

SRQ

The status byte is used to create a service request. Whenever a condition occurs in the ST-103 which requires service from the controller and the condition is enabled, the SRQ (Service Request) line will be set. The SRQ will be reset after the controller finishes a serial poll of the ST-103 or when all of the enabled service request conditions have stopped.

STANDARD EVENT STATUS REGISTER

The ESB bit is the summary of the Standard Event Status Register. This byte has an enabling byte which works in a similar manner to the above Status Byte. The individual bits within the Standard Event Status Register represent the different conditions which might cause a Standard Event. The bit definitions for the Standard Event Status Register are as follows:

Bit 1 : Operation Complete
Bit 2 : Request Control
Bit 3 : Query Error
Bit 4 : Device Dependent Error
Bit 5 : Execution Error
Bit 6 : Command Error
Bit 7 : User Request
Bit 8 : Power On

Operation Complete - Only set following an *OPC command.

Request Control - Not used.

Query Error - Set under the following conditions:

- when output has been requested from the ST-103 and none is available,
- when a command is sent to the ST-103 and the ST-103 still has a message available,
- when output has been requested from the ST-103 and an unterminated command has been sent to the ST-103.

Device Dependent Error - Not used.

Execution Error - Set under the following conditions:

- when a command parameter is out of range,
- when the command has too many or too few parameters,
- when the command cannot be properly executed due to a device condition.

Command Error - Set whenever the ST-103 receives an unrecognized command, or invalid GPIB command.

User Request - Not Used.

Power On - Set whenever the ST-103 is powered on.

STANDARD EVENT STATUS ENABLE REGISTER

The different conditions within the Standard Event Status Register can be individually enabled and disabled. The Standard Event Status Enable Register contains enabling bits. Each time one of the event conditions or one of the enabling bits change, the status of the ESB bit is re-evaluated; If any status bit is set and its corresponding enable bit is set, the ESB bit will be set.

Each time the ST-103 is powered on, this byte is reset so that no bits are enabled. The bit definition for the Standard Event Status Enable Register is the same as for the Standard Event Status Register.

GPIB COMMON COMMANDS

The following commands are provided to use with the GPIB status reporting, as defined by IEEE 488.2 for service request:

*STB?, *SRE, *SRE?, *ESR?, *ESE, *ESE?, *CLS

7.8 COMMAND EXAMPLES

The following lists a brief example of an interactive remote session with the ST-103:

```
>SPE_MODE BURST
>SPE_MODE?
 BURST
>LOS_TIME 135E-6
>DS3_PYLD INT
>DS3_PATTERN?
 PRBS
>AIS_MODE CONT
>AIS_MODE?
 CONT
```

To ensure proper communications with the ST-103, the Status Bytes listed under GPIB STATUS REPORTING should be used. The Status Bytes will indicate if a programming error has occured (Ex: using the command incorrectly or trying to set the ST-103 to an invalid state). The Status Bytes can also be used to indicate when a Message is available to be read from the ST-103, which will prevent time-outs on the GPIB Bus due to reading with no message available.

Following each time the ST-103 has been sent a command, the Status Byte should be polled to determine if a condition has occured which would indicate that the command was not accepted. This requires initializing the Enable Registers to allow the desired conditions to activate the Standard Event Status Bit. Prior to reading any response from the ST-103, the Status Byte should be polled to determine if a Message is actually available to be read. No initialization is needed for this.

7.9 IEEE-488.2 PROGRAMMING MANUAL REQUIREMENTS

Certain programming requirements are specified for GPIB interfaces by the American National Standard Institute (ANSI) document, ANSI/IEEE Std 488.2-1987, which are detailed in this section.

POWER ON SETTINGS

The ST-103 will restore the device settings to their values from when it was last powered off. There are no remote commands which will affect this. The only exception to this is when the non-volatile RAM becomes corrupted, (which should never happen during normal unit operation). RAM Corruption, if it occurs will be displayed on the units LCD display. When this happens, the ST-103 will have the default settings.

MESSAGE EXCHANGE

The following message exchange options are as follows:

- The input buffer is command line oriented. There will be a new input buffer for each command line, or program message. The input buffer has a maximum length of 80 characters.
- The only remote commands which will return more than one response message unit (responses separated by semi-colons) are the following:

  *lrn? , oh_all? , oh_err_all?

- All queries (commands) generate their response messages immediately when they are parsed. No queries wait until the responses are read for them to be generated.
- No commands are coupled.

FUNCTIONAL ELEMENTS

A list of the functional elements which are used by the ST-103 is required by the IEEE 488.2 standard. These are the functional elements used in constructing the remote commands that control the ST-103. For further details about this, see the IEEE 488.2 standard, sections 4.3, 7.1.1, and 7.3.3.

From Tables 4.2 and 4.3 of the IEEE 488.2 standard, the ST-103 performs the following:

<PROGRAM MESSAGE>

<PROGRAM MESSAGE TERMINATOR>

<PROGRAM MESSAGE UNIT>

<PROGRAM MESSAGE UNIT SEPARATOR>

<COMMAND MESSAGE UNIT>

<QUERY MESSAGE UNIT>

<COMMAND PROGRAM HEADER> *

<QUERY PROGRAM HEADER> *

<PROGRAM HEADER SEPARATOR>

<PROGRAM DATA SEPARATOR>

<PROGRAM DATA>

<DECIMAL NUMERIC PROGRAM DATA>

<CHARACTER PROGRAM DATA>

* <compound command program header> and <compound query program header> are not handled.

SPECIFIC COMMAND IMPLEMENTATIONS

Reset Command

The reset command, "*rst", performs a device reset. As defined in the IEEE 488.2 standard it will:

- Resets the device settings to default settings,
- Macros are not implemented in the ST-103, macros are ignored.
- Forces the ST-103 into Operation Complete Command Idle State (OCIS) and Operation Complete Query Idle State (OQIS).

Self Test Query

The scope of the self test function is limited; it tests the basic ST-103 functionality.

Overlapped vs Sequential Commands

All commands are sequential commands.

Operation Complete Message

All commands actions are immediate (no overlapped commands), such that operation complete is immediate.

RECEIVER OVERVIEW

8.1 GENERAL

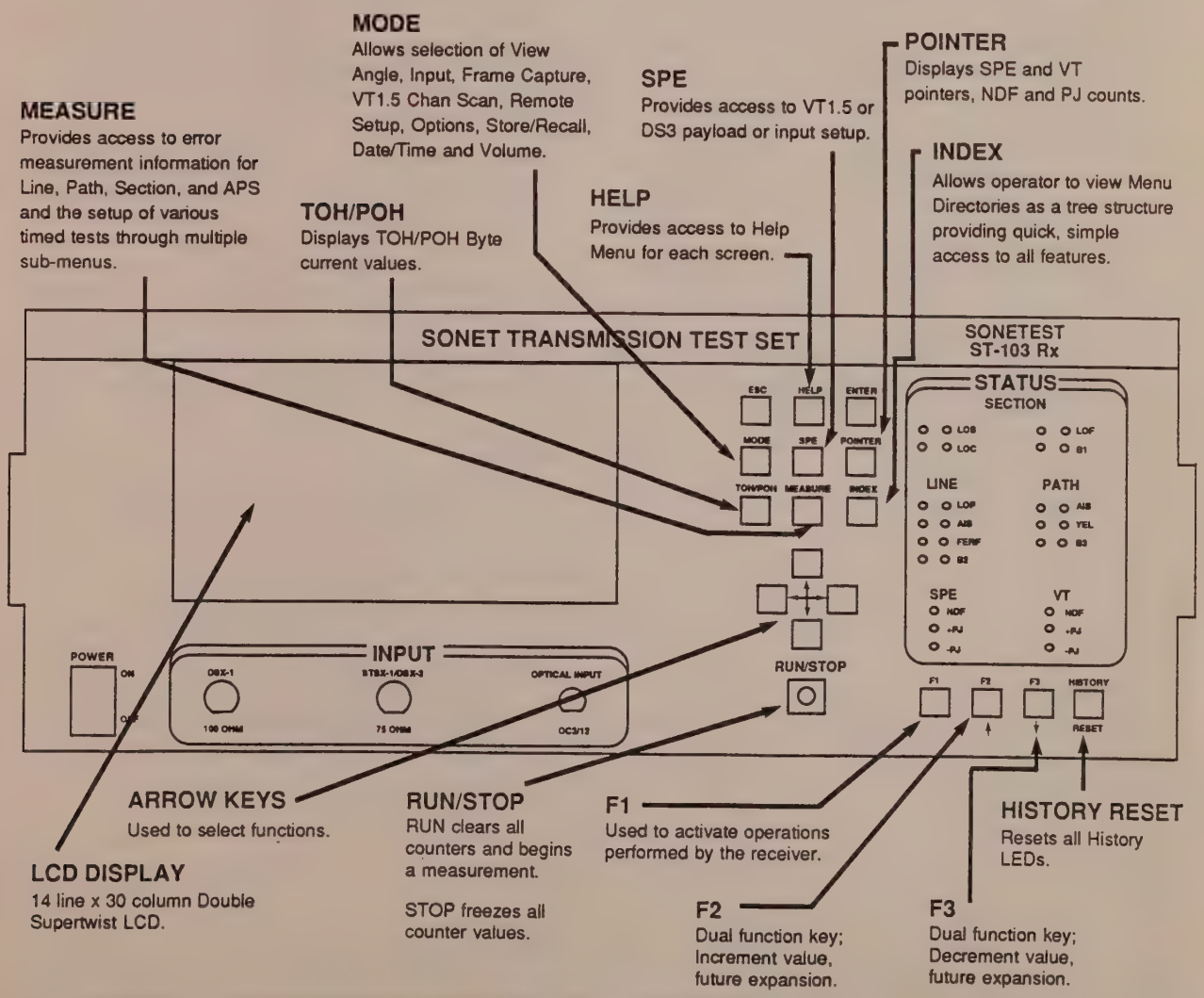
The Receiver accepts several different input signals depending on mode. In the SONET mode, the input may be STSX-1, STS1 (ECL), OC-3, or STS3 (ECL). Additionally, with the OC-12 option, it will accept OC-12 or STS12 (ECL). The SONET frame is detected, B1, B2 and B3 are calculated and errors are detected and stored. The payload is detected and standard measurements on Parity and Bits are made, stored and displayed. The contents of the Section, Frame and Path overhead bytes are brought out sequentially via a rear panel connector and may be selectively viewed on the front panel LCD. LED status indicators are also provided for SONET frame Section, Line and Path Overhead and for payload. The front panel 14 line LCD display is manipulated by function and cursor control keys to provide the user with total access to all performance data. GPIB and RS-232C control is provided and a parallel printer port may be used for time tagged report output.

In the non-SONET mode, the Receiver will operate as a DS3 only or DS1 only set, accepting a DSX-3 or DSX-1 signal and performing the variety of measurements described below.

8.2 RECEIVER FRONT PANEL

8.2.1 Controls

The controls cause Menus to appear on the LCD display allowing the user to access and view all system parameters. The Receiver configuration may be set or modified. On each Menu, the presence of a second level menu is indicated by "..." at the end of a line. No Menu is greater than two levels deep.


MODE
Allows selection of View Angle, Input, Frame Capture, VT1.5 Chan Scan, Remote Setup, Options, Store/Recall, Date/Time and Volume.
SPE
Provides access to VT1.5 or DS3 payload or input setup.
POINTER
Displays SPE and VT pointers, NDF and PJ counts.
MEASURE
Provides access to error measurement information for Line, Path, Section, and APS and the setup of various timed tests through multiple sub-menus.
TOH/POH
Displays TOH/POH Byte current values.
HELP
Provides access to Help Menu for each screen.
INDEX
Allows operator to view Menu Directories as a tree structure providing quick, simple access to all features.
SONET TRANSMISSION TEST SET
SONETEST ST-103 Rx
STATUS
SECTION
LINE
PATH
SPE
VT
INPUT
POWER
RUN/STOP
HISTORY RESET
ARROW KEYS
Used to select functions.
RUN/STOP
RUN clears all counters and begins a measurement.
STOP freezes all counter values.
F1
Used to activate operations performed by the receiver.
F2
Dual function key; Increment value, future expansion.
F3
Dual function key; Decrement value, future expansion.
LCD DISPLAY
14 line x 30 column Double Supertwist LCD.

8.2.2 Status LEDs

Section: History and Current for LOS, LOC, LOF and B1.

Line: History and Current for LOP, AIS, FERF and B2.

Path: History and Current for AIS, Yellow and B3.

SPE : Current for NDF, +PJ and -PJ.

VT: Current for NDF, +PJ and -PJ.

8.2.3 Display Menus

The main and sub-menus that are available to the user are listed here. Access, content and meaning of each menu is described in the Operating Instructions.

CONFIGURATION

MODE MENU

- VIEW ANGLE
- QUICK SETUP
- INPUT(SONET RATE,DSX)
  - SIGNAL
  - DATA
  - CLOCK
  - STS-1/3 DESCRAMBLER
  - BIPOL LEVEL
- FRAME CAPTURE
  - TRIGGER SOURCE
  - STORE
  - TRIGGER ADDRESS
  - TRIGGER WORD
  - FRAMES AFTER TRIGGER
  - DISPLAY FRAME
  - ARM TRIGGER
- VT 1.5 CHANNEL SCAN
- REMOTE SETUP
  - GPIB
  - RS232
- PRINTER
  - ENABLE
  - PORT
- OPTIONS
- STORE/RECALL
- SET DATE/TIME
- VOLUME

SPE MENU

- VT 1.5 / DSX1
  - MAPPING
  - CHANNEL
  - AUTO SEARCH
  - PATTERN
  - FRAMING
  - PAYLOAD ENABLE
- DS3 / DSX3
  - AUTO SEARCH
  - PATTERN
  - FRAMING
  - PAYLOAD ENABLE

POINTER MENU

TOH/POH MENU

MEASUREMENT MENU

- ERROR DISPLAY
- APS
- MEASURE CONTROL
  - TIMING
  - TEST TIME
  - SQUELCH
  - CLEAR
- REPORT CONTROL
  - PRINT ON ERROR
  - PRINT AT END OF TEST
  - TEST FORM
  - PRINT ERROR LOG
  - PRINT TEST NOW

8.2.4 Inputs

DSX-1: Cross-Connect input, accepts 310 plug, 100 ohm, 6 V pk-pk.

STSX-1/DSX-3 : Cross-Connect input, BNC, either STSX-1 or DSX-3, 75 ohm, 1 V nominal.

OC-3/12

a) Sensitivity, -28dBm at 2.5x10-10 BER, Wave length, 1310 nm. Accepts input as described by OC-3 Short Reach Requirement.

b) Connector, FC/PC.

8.3 RECEIVER REAR PANEL

ERROR

a) B3, output, error in B3 byte, TTL pulse, 50 ohms to Gnd.

b) Bit, output error in selected payload,

STS1 IN

a) Data and complement, Differential, ECL, 50 ohms to -2V.

b) Clk ECL, 50 ohms to -2V.

STS3

Input, Data and Clk, ECL, 50 ohms to -2V.

STS12

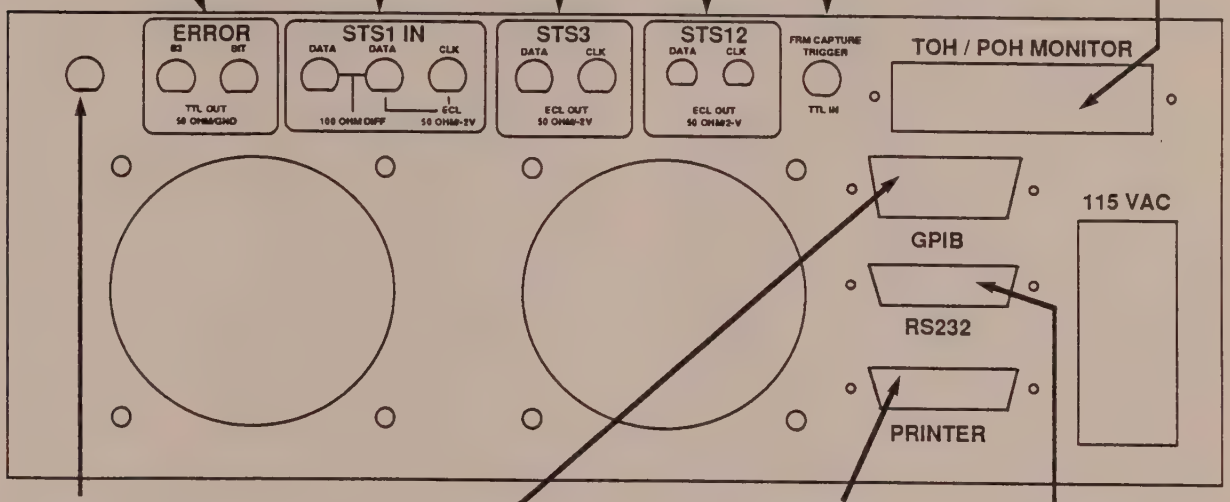
Input, Data and Clk, ECL, 50 ohms to -2V.

FRAME CAPTURE TRIGGER

Input, TTL.

TOH/POH MONITOR

Parallel Output TOH/POH bytes 4x9 bytes per 125 µsec.



SPARE

User specified optional signal.

GPIB

Control port, standard connector, GPIB address is menu controlled.

PRINTER

Parallel printer port, Centronics Connector.

RS-232C

Control port, standard connector.

RECEIVER OPERATING INSTRUCTIONS

For a clear understanding of the operation of the Receiver, it is recommended that a Receiver be at hand and operated in the sequence with the instructions.

9.1 POWER ON AND CURRENT CONFIGURATION

When the ST-103 Rx is initially powered on, several screens will appear identifying the model, type and software version. After those screens have appeared, a CURRENT CONFIGURATION screen appears. This screen is a synopsis of the receiver's current set-up configuration. No options can be selected, or changed, from this menu. Besides appearing at initial turn-on, it can be accessed at any time by pressing the ESC button once or twice at any time. The following is a description of each entry on the screen.

9.1.1 SIGNAL:
This is the selected input to the receiver upon which measurements will be made. The available selections are STS-1, STS-3, STS-12 (if the STS-12/OC-12 option is installed), DS1 or DS3 depending on the selected payload. Selection is made in the MODE INPUT menu.

9.1.2 DATA:
This entry indicates the signal format, and which connector will be used for the DATA input. The available selections are NRZ-ECL, NRZ-DIFF, BIPOLar, and OPTIC. Both NRZ inputs use the rear panel connectors. The BIPOLar selection uses the front panel input connectors. OPTIC requires an optical signal into the front panel optical connector. Selection is made from the MODE INPUT menu.

9.1.3 CLOCK:
This is the clock that will be used. Selections are NRZ-ECL or RECOVERED. Selection is made in the MODE INPUT menu.

9.1.4 DESCRAM:
This selection indicates the status of the STS-1/STS-3 descrambler. It can be either ON or OFF. Selection is made from the MODE INPUT menu.

9.1.5 STS:
This item indicates which STS-N is being measured. Selection is made in the MEASURE ERROR DISPLAY menu.

9.1.6 VT CHAN:
This item indicates which VT channel is being measured. This item is applicable only to VT1.5 payloads. Selection is made in the SPE VT1.5 menu.

9.1.7 PAYLOAD:
This entry shows the selected payload. Selection is made in the SPE menu.

9.1.8 ALARMS:
These entries show the current alarm status of the selected payload. The alarms displayed are current and depend on the payload selected. Selection of the payload is made in the SPE menu.

9.1.9 SPE POINTER:
This item indicates the current SPE pointer value. The entry originates in the POINTER menu.

9.1.10 VT:
This item indicates the current VT pointer value. It is valid only if a VT1.5 payload has been selected in the SPE menu. The entry originates in the POINTER menu.

9.1.11 VT PATH ALARMS:
If a VT payload is selected, then this entry will show any current VT path alarms. This entry will be blank for DS3 payloads. The entries originate in the MEASURE ERROR DISPLAY menu.

9.1.12 APS:
These entries indicate the current values of the K1 and K2 bytes and if the values are inconsistent. These entries originate in the MEASURE APS menu.

9.1.13 ERRORS:
This entry will show any current payload alarms. The entries originate in the MEASURE ERROR DISPLAY menu.

9.2 HELP MENUS

Each menu has extensive help associated with it besides the information contained in this manual. This extensive HELP system is always available and is accessed as follows:

1) Select the menu by pushing the appropriate MENU button on the Receiver front panel.

2) Push the HELP button.

The help information will be displayed and, if larger than one screen, can be scrolled using the arrow keys.

3) Leave the HELP system by pushing the ESC button.

9.3 THE ST-103 MENU SYSTEM

The ST-103 receiver has been designed for ease of use in selecting parameters for the signal that is to be received. To do this, the various tasks have been divided into six different menus. Five of these menus select different categories while the sixth is a compilation of the other five.

The first five menus are MODE, SPE, POINTER, TOH/POH, and MEASURE. These five categories comprise all of the various selectable parameters and measurement display. The sixth, INDEX, is a single listing of all the entries in the first five menus. This INDEX menu is included to allow the user to find and get to any menu or sub-menu quickly. It also provides an overview of the entire menu selection in the receiver.

Any of the first five menus is selected by pushing the corresponding menu key. Then use the up/dn arrow keys to select the item desired, and then press the ENTER key. Push the ESC key to back out one level from any menu. From the INDEX menu, any selection in any menu can be obtained by the use of the up/down arrow keys and the ENTER key.

9.4 MODE MENU

9.4.1 VIEW ANGLE submenu

This feature allows adjustment for the most comfortable screen viewing angle. There are 16 selection values from 0 to 15. Use the < > arrow keys to change selection.

9.4.2 QUICK SETUP submenu

There are 8 different factory installed test setups that are factory defined and are not user changeable. These setups are defined in Appendix E. Use the arrow keys to select, and then press ENTER. The MASTER DEFAULT setup will return the unit to a factory defined state should there be any questions regarding its current state. Use up/dn and < > arrow keys to select, then press ENTER.

9.4.3 INPUT submenu

9.4.3.1 SIGNAL:

This is the selected input to the receiver upon which measurements will be made. The available selections are STS-1, STS-3, STS-12 (if the STS-12/OC-12 option is installed), DS1 or DS3. Use the up/dn and < > arrow keys to select, then press ENTER.

9.4.3.2 DATA:

This entry selects the signal format, and which connector will be used for the DATA input. The available selections are NRZ-ECL, NRZ-DIFF, BIPOLar, and OPTIC. All NRZ inputs use the rear panel connectors. The BIPOLar selection uses the front panel input connectors. OPTIC requires an optical signal into the front panel optical connector. Use the up/dn and < > arrow keys to select, then press ENTER.

9.4.3.3 CLOCK:

This is the clock that will be used. Selections are NRZ-ECL or RECOVERED. The NRZ-ECL inputs use the rear panel connectors. The recovered clock is derived from the selected data. Use the up/dn and < > arrow keys to select, then press ENTER.

9.4.3.4 STS-1/3 DESCRAMBLE:

This entry allows selection of the status of the STS-1/STS-3 descrambler. It can be either ON or OFF. The Descrambler must be ON for recovered clock. Use the up/dn and < > arrow keys to select, then press ENTER.

9.4.3.5 BIPOL LEVEL:

This entry allows selection of the bipolar input level for either the DSX-1 or STSX-1/DSX-3 inputs. It can be either TERMINATE or BRIDGE. When TERMINATE is selected, the receiver expects to see the standard DSX input level. When BRIDGE is selected, the input gain is increased by approximately 20 dB to account for the loss in the monitor jack isolation circuitry. Use the up/dn and < > arrow keys to select, then press ENTER.

9.4.4 FRAME CAPTURE submenu

This menu selection sets the parameters for the frame capture function. Frame capture allows for storing overhead and payload data for analysis.

9.4.4.1 TRIGGER SOURCE:

This menu item selects where the trigger source will come from to initiate the frame capture function. The choices are INTernal or EXTernal. Internal refers to a trigger word and address that will be set later in the FRAME CAPTURE menu. External refers to a FRAME CAPTURE TRIGGER jack that is a TTL signal that must be pulled low. It is independent of the TRIGGER WORD and TRIGGER ADDRESS that is set later in the FRAME CAPTURE menu. Use the up/dn and < > arrow keys to select, then press ENTER.

9.4.4.2 STORE:
This menu item allows selection of what information is to be stored. The selections are TOH, POH, SPE, or ALL. The selection made determines the maximum number of frames that can be saved. Use the up/dn and < > arrow keys to select, then press ENTER.

The limits are:

TOH Only transport overhead bytes will be stored (1213 frames).

POH Only path overhead bytes will be stored (3640 frames).

SPE All SPE bytes will be stored (41 frames).

ALL The entire SONET STS-1 SONET frame will be stored (40 frames).

9.4.4.3 TRIGGER ADDRESS:
In this menu item the byte selection of the STS-1 SONET frame trigger is made. For TOH and ALL, select from the 27 TOH bytes. For POH and SPE select from the 9 POH bytes or an offset from J1. Use the up/dn and < > arrow keys to select, then press ENTER.

9.4.4.4 TRIGGER WORD:
In this menu item the contents of the TRIGGER ADDRESS (the Frame Capture trigger) is made. The trigger must be set to INTernal. Use the < > arrow keys to select which bit is to be changed. Use either the F2 or F3 keys to change the value of the bit. The choices for each bit are 0, 1, and X where X=don't care.

9.4.4.5 FRAMES AFTER TRIGGER:
This menu item sets the number of frames that will be captured after the frame capture trigger occurs. This setting must be used in conjunction with the number of frames that can be stored as described in 9.4.4.2 above. If fewer than the number of total frames as defined in 9.4.4.2 above is entered, then the excess will become stored frames before the trigger. For example, if ALL is selected and frames after trigger is set to 20, then 40-20 frames will be stored before the trigger and 20 frames will be stored after.

It is also possible to specify the number of frames such that all captured frames are after the trigger. For example, if the storage capacity is 40 frames and the Frames After the Trigger is set to 90, then frames #51 to 90 will be captured and stored. Use the < > arrow keys to select which bit is to be changed. Use either the F2 or F3 keys to change the value of the bit.

9.4.5 VT 1.5 CHANNEL SCAN submenu
This function allows the receiver to quickly scan all 28 DS1 channels in the selected STS-N repeatedly. It can identify the type of contents of each channel, and identify the channel mapping when the source is the ST-103 transmitter. Use the up/dn arrow keys to select the function, and press ENTER. Press the F1 key to activate the Channel Scan. The channel scan uses the following coding scheme to identify each channel's contents:

U	Unframed.
D	D4 Framing.
E	ESF Framing.
FX	Fixed word data pattern.
9,15,20,23	PN9,15,20,23 PRBS Pattern.
QW	Quasi-Random data pattern.
?	Unknown data pattern.
chxx	Background mapped channel when the ST-103 Tx is used.
XX	is the originating channel number (01 to 28). **Note:** The ST-103 Tx fills these channels with D4 framed fixed words.

9.4.6 REMOTE submenu
This screen is self explanatory in that it allows setup of either the GPIB or RS-232 parameters.

The GPIB selections allow selection of the ADDRESS or TERMINATOR.

The RS-232 selections allow selection of BAUD rate, PARITY, CHARacter SIZE (7 or 8 bits), EOL (end of line terminator), XON/XOFF flow control, and ECHO (which will determine if the ST-103 Receiver will echo any commands sent to it).

9.4.7 PRINTER submenu
Master control of a Printer is controlled thru this menu.

9.4.7.1 ENABLE:
This ON/OFF function provide a master enable function for an external printer. A printer operation and form may be set up on other menus and then enabled and disabled form this menu while retaining the setup. Upon transition to OFF, the printer queue is cleared.

9.4.7.2 PORT:
Selection of parallel, RS-232C or GPIB ports for output to printer. The GPIB selection is not for a GPIB printer but to a GPIB controller; the GPIB is not Talk Only.

9.4.8 OPTIONS submenu
This menu indicates what options are installed in the receiver.

9.4.9 STORE/RECALL submenu
This function is similar to the QUICK SETUP discussed earlier. The difference is that these 10 setups are user definable. To use this function, first set up the receiver for a test. Then select the STORE/RECALL function.

1) Use the up/dn arrow keys to select which location for saving the setup.
2) Use the < > arrows to select the EDIT function and then press the ENTER key.
3) Use the up/dn arrow keys to scroll through all the letter and number combinations and the < > keys to select the character position to give the test a unique name.
4) When the name is complete, press the ENTER key.
5) Use the < > arrow keys to select STORE and then press the ENTER key.

This sequence STORES a complete test set-up configuration. Existing configurations can be overwritten by using the same procedures as described above.

To use a stored configuration, select the test as described in step 1) above. Select RECALL rather than EDIT using step 2) above. The selected configuration is now active.

9.4.10 SET DATE/TIME submenu
This function sets the internal clock and calendar. Use the up/dn arrow keys to select the function, press the ENTER key. Use the < > arrow keys to select which digit is to be changed. Use either the F2 or F3 keys to change the value of the digit.

9.4.11 VOLUME submenu
This function allows for changing, and turning off, the audible error indicator. Use the < > keys to change the volume. Zero (0) is off, 9 is loudest.

9.5 SPE MENU
This menu selects the type of Payload that has been mapped into the SONET signal. The choices are either a VT1.5 or a DS3 signal. Use the up/dn and < > arrow keys to select.

9.5.1 VT1.5 / DSX1 submenu

9.5.1.1 MAPPING:
Use the < > arrow keys to select either LOCKED or FLOATING modes.

9.5.1.2 CHANNEL:
Selection of the channel number (1 to 28) for monitoring is made with this menu. If the ST-103 transmitter is used as the signal source, one active channel will contain a selected DS1 signal and the remaining 27 background channels will contain uniquely numbered D4 framed 24 bit words. Use the < > arrow keys to select which digit is to be changed. Use either the F2 or F3 keys to change the value of the digit

9.5.1.3 AUTO SEARCH:
This function will cause the receiver to automatically determine the pattern and framing format of the payload. The choices are ON or OFF. If off, the pattern and framing format must be set manually in the following PATTERN and FRAMING menus. Note: The 2^{20}-1 pattern is not searched. Use the up/dn and < > arrow keys to select, then press ENTER.

9.5.1.4 PATTERN:
This selects the data pattern against which the DS1 is compared. The 24 bit pattern is any repeating 24 bit word, the 2^{9}-1, 2^{15}-1, 2^{20}-1,2^{23}-1 and QRW patterns are PRBS patterns. Use the up/dn and < > arrow keys to select, then press ENTER.

9.5.1.5 FRAMING:
The choices are either UNFRAMED, D4, and ESF framing. Use the up/dn and < > arrow keys to select, then press ENTER.

9.5.1.6 PAYLOAD ENABLE:
Once the payload is set-up, it must be enabled. Select this option with the up/dn key and then press F1. Once enabled, the word ACTIVE along with an indicator will appear at the bottom of the screen. NOTE: Only one type of payload can be active at a time. If the DS3 payload was active, activating the VT1.5 payload will automatically deactivate the DS3 payload.

9.5.2 DS3 / DSX3 submenu

9.5.2.1 DS3 PAYLOAD:
This selects a DS3 payload.

9.5.2.2 AUTO SEARCH:
This function will cause the receiver to automatically determine the pattern and framing format of the payload. The choices are ON or OFF. If off, the pattern and framing format must be set manually in the following PATTERN and FRAMING menus. Use the up/dn and < > arrow keys to select, then press ENTER.

9.5.2.3 PATTERN:
This selects the data pattern against which the DS3 is compared. The 8 bit pattern is any repeating 8 bit word, the 2^{15}-1 is an inverted PRBS pattern. Use the up/dn and < > arrow keys to select, then press ENTER.

9.5.2.4 FRAMING:
The choices are M13, CBIT, or UNFRAMED.

9.5.2.5 PAYLOAD ENABLE:
Once the payload is set-up, it must be enabled. Select this option and then press F1. Once enabled, the word ACTIVE along with an indicator will appear at the bottom of the screen. NOTE: Only one type of payload can be active at a time. If the VT1.5 payload was active, activating the DS3 payload will automatically deactivate the VT1.5 payload.

9.6 POINTER MENU

This menu allows viewing both SPE and VT pointer information simultaneously.

The pointer information that is displayed is:

SPE:
Current SPE Pointer.
Total count of NDFs.
Total count of both positive and negative Pointer Justifications.
Pointer out of range current and history indication.

VT:
Current VT Pointer.
Total count of NDFs.
Total count of both positive and negative Pointer Justifications.
Pointer out of range current and history indication.

If ">>" appear in front of any counts, it indicates a counter overflow. An inverse video "*" indicates current pointer out of range. An inverse video "H" indicates that the pointer was out of range at least once during the test.

Pressing HISTORY RESET clears the "H" indicators.

Pressing RUN/STOP clears all the counts.

9.7 TOH/POH

This menu is a real time display of all TOH and POH overhead values. The first three columns of 9 bytes each is the TOH. The last column of 9 bytes is the POH. The bottom row is VT Overhead if available. Each hex digit represents four bits.

9.8 MEASURE MENU

This menu displays all Bit Error Rate measurements, Automatic Protection Switching, and control over Timed, Untimed or Repeat tests for the section, line, path and payload.

9.8.1 ERROR DISPLAY submenu
This menu item allows display of all Bit Error Rate measurements. Use the up/dn and < > arrow keys to select, then press ENTER.

9.8.1.1 STS:
This menu item allows selection of the specific STS-N for which error measurements will be made. Use the up/dn arrow keys to select STS. Use the < > arrow keys to select which digit is to be changed. Use either the F2 or F3 keys to change the value of the digit, press the ENTER key when the setting is correct. The limits are shown next to the entry. Note: Changing this value invalidates any test in process.

9.8.1.2 VT:
If a VT payload has been selected, then there will be a VT selection in the upper right hand corner of the screen. For DS3 payloads, this entry does not appear. Use the same procedure as in 9.8.1.1 above to set which of the 28 VT's will be measured when VT PAYLOAD is selected for display.

9.8.1.3 SELECTION OF MEASUREMENTS TO BE DISPLAYED

Use the up/dn arrow keys to move the highlighted arrow at the left edge to the second line of the display. Use the < > arrow keys to highlight SECTION, LINE, PATH, or either DS3 PYLD or VT PYLD. As each is highlighted, the display will change to display all measurements associated with the selection.

The display generally consists of either a count or a rate display for each entry, except for the PAYLOAD display, which has both.

Alarm indicators consist of an inverse video "*" to indicate a current alarm, and an inverse video "H" to indicate that the alarm has occurred at least once during the test.

9.8.2 APS submenu

This menu displays test results for Automatic Protection Switching tests. Use the up/dn and < > arrow keys to select, then press ENTER.

9.8.2.1 K1, K2:

These are the current values for the K1 and K2 SONET APS signalling bytes.

9.8.2.2 COUNT:

This is the total count during the test of the number of APS switches that have occurred.

9.8.2.3 DURATION:

This is the total duration, in seconds, of APS switching.

9.8.2.4 CODE:

This is the current APS code. Both the code number and its corresponding message are included.

CODE NUMBER	MESSAGE
0	No Request
1	Do Not Revert
3	Reverse Request
4	invalid (unused)
5	Exerciser
6	invalid (unused)
7	Wait to Restore
8	invalid (unused)
9	Manual Switch
10	invalid (unused)
11	Signal Degrade-Low Priority
12	Signal Degrade-High Priority
13	Signal Fail-Low Priority
14	Forced Switch
15	Lockout of protection

9.8.2.5 CHANNEL:

This number is the channel number for which the request is issued as shown below:

Channel 0 : Protection channel requesting switch action, or a No Request with no extra traffic input. The protection channel is supplied with a signal containing valid transport overhead.

Channel 1-14: The number of the working channel requesting switch action.

Channel 15 : Extra Traffic Channel requesting switch action (not valid for 1+1).

9.8.2.6 INVALID, INCONSISTENT:

Both current and history indications of occurrences are indicated.

INVALID codes are defined as unused codes as defined in 9.8.2.4 above.

INCONSISTENT APS bytes are defined as 12 successive frames where no 3 consecutive frames contain identical APS bytes.

9.8.3 MEASURE CONTROL submenu

This menu allows setting the test time duration for TIMED or REPEAT measurements, error squelching and clearing of error logs. Use the up/dn and < > arrow keys to select, then press ENTER.

9.8.3.1 TIMING:

This menu item allows selection of the type of test timing to be used when running a test. Use the up/dn and < > arrow keys to select, then press ENTER.

The selections are:

UNTIMED: The test is manually started and it will continue to run until manually stopped. This is done with the RUN/STOP key. A test is running when the green indicator is illuminated in the center of the button.

TIMED : The test is started manually and will continue to run for the time duration set under TEST TIME in section 9.8.3.2 below, and then stop. This is done with the RUN/STOP key. A test is running when the green indicator is illuminated in the center of the button. The test can be terminated at any time by pressing the RUN/STOP key.

REPEAT : The test is started manually and will continue to run for the time duration set under TEST TIME in section 9.8.3.2 below. Upon completion of the test, the receiver will automatically reset and restart the test. This will continue until manually stopped. This is done with the RUN/STOP key. A test is running when the green indicator is illuminated in the center of the button. The test can be terminated at any time by pressing the RUN/STOP key.

9.8.3.2 TEST TIME:
This menu item allows setting the test time duration. Use the up/dn arrow keys to select TEST TIME. Use the < > arrow keys to select the digit to be changed. Use either the F2 or F3 keys to change the value of the digit, press the ENTER key when the setting is correct. The maximum test time is 9 days, 23 hours, 59 minutes, 59 seconds. The minimum test time is 1 second.

9.8.3.3 SQUELCH:
If set to ON, error logging and printing will be squelched after ten consecutive errored seconds and cleared after ten consecutive seconds of no errors.

9.8.3.4 CLEAR:
During any period while the Receiver is in the RUN condition (RUN LED on), error events are logged into time stamped memory with one second resolution. The CLEAR function clears from memory all accumulated errors.

9.8.4 REPORT CONTROL submenu
This menu controls the printing of error data to an external printer. The printer port selection was made from the MEASURE CONTROL menu.

9.8.4.1 PRINT ON ERROR:
Prints one line of any error type (front panel LEDs) with time stamp. The error information is also stored in memory. Notes: Only the error type, not the error type count are printed. The Receiver must be in RUN mode.

9.8.4.2 PRINT AT END OF TEST:
At the end of a Single timed or Repeat test, all error types, error counts and status of LEDs are printed.

9.8.4.3 FORM:
SHORT or LONG form selection of error prints at end of test. In SHORT form, only errored data are printed or displayed. In LONG form all measured conditions, whether or not errors were present, are printed or displayed in a fixed form so that any piece of data is easily found. Both types of printouts will include a header with setup and test time information.

9.8.4.4 PRINT ERROR LOG:
Prints all errored second one line reports that have been accumulated since last error log CLEAR. An example of use of this command is for a remotely located receiver to be set up for a test via RS-232, the test data accumulated and stored in the receiver and then remotely commanded to output the accumulation during the test or at the end of the test.

9.8.4.5 PRINT TEST NOW:
Causes accumulated errored test data to be printed. Can be used to get a snapshot of an extended test in process. Executing this command does not clear any accumulated error data.

9.9 EXAMPLE SETUP

As an example, assume that an OC-3 SONET signal is to be analyzed using a 15 minute repeating test with the test results printed to a local printer on error and at the end of each 15 minute segment. The procedure for setting up the Receiver follows.

9.9.1 THE SONET SIGNAL

Optical at the OC3 rate.

A floating VT1.5 payload with the test signal on Channel 6 of the second STS-1.

9.9.2 THE RECEIVER SETUP

Using the signal criteria in section 9.9.1, the sequence to be used to set up the Receiver (other than using either the QUICK SETUP or STORE/RECALL functions) is:

9.9.2.1 MASTER DEFAULT

1) To be sure of the starting point, set the receiver to the MASTER DEFAULT.
2) Enter the MODE MENU and use the arrow keys to select QUICK SETUP.
3) Push the ENTER button.
4) Use the arrow keys to select MASTER DEFAULT and push the ENTER key.

The receiver is now set to the Factory Default settings.

9.9.2.2 MENU SELECTION AND SETUP

1) First set up the payload by entering the SPE menu.
2) Select VT1.5/DSX1 and press ENTER.
3) Since the payload MAPPING is FLOATING, select FLOATING for the MAPPING entry of the menu.
4) Set CHANNEL to 6.
5) Set the AUTO SEARCH to ON. Skip to 7 below or set the AUTO SEARCH to OFF and set the pattern and framing manually as described below.
6) Set the PATTERN to one of the six choices and the FRAMING to be either UNFRAMED, D4 or ESF. If the 24 BIT word is selected, any 24 bit repeating word will work.
7) Select PAYLOAD ENABLE and press F1. The word ACTIVE will appear.
8) Next enter the MODE menu.
9) Select INPUT. Press the ENTER key.
10) Select the SIGNAL to be STS-3.
11) SET the DATA to OPTIC.
12) Set CLOCK to RECOVERED.
13) Set the STS-1/3 DESCRAMBLER to ON or OFF (normally set to ON).
14) Select PRINTER. Press the ENTER key.
15) Set ENABLE to ON.
16) Set PORT to be RS-232. When all selections are made, press the ENTER key.
17) Next enter the MEASURE menu.
18) Select MEASURE CONTROL. Press the ENTER key.
19) Set TIMING to REPEAT.
20) Using the up/down and < > keys, set the TEST TIME to 0:00:15:00.
21) Set SQUELCH to ON. When all selections are made, press the ENTER key.
22) Select REPORT CONTROL. Press the ENTER key.
23) Set PRINT ON ERROR to ON.
24) Set PRINT AT END OF TEST to ON.
25) Set TEST FORM to SHORT. When all selections are made, press the ENTER key.

This completes the setup allowing measurement and print out of errors of the SONET signal. POINTER and MEASUREments, and other parameters can be viewed at any time depending on test requirements.

RECEIVER RS-232C INTERFACE APPLICATION INFORMATION

10.1 REMOTE INTERFACE CAPABILITIES

The ST-103 supports remote control through the RS-232C interface bus connector on the rear panel. The unit can be operated from the front panel and over the remote interface simultaneously. Any unit status changes made remotely will be displayed on the front panel. All of the front panel functions can be controlled over the RS-232C interface bus, except 'POWER'.

The remote commands sent to the ST-103 differ from front panel control. The current operating mode is entered directly rather than through sub-menus.

10.2 INTERFACE DEVICE SETTINGS

The RS-232C interface device settings are programmable through the front panel. The following RS-232C parameters are programmable, along with the possible selections and the default setting in parentheses:

PARAMETER	(DEFAULT)	VALUES
■ BAUD RATE :	(9600)	2400, 1200, 300
■ PARITY :	(EVEN)	NONE, ODD
■ DATA SIZE :	(8)	7
■ EOL :	(CR/LF)	LF/CR, CR, LF
■ XON/XOFF :	(ON)	OFF
■ ECHO :	(ON)	OFF

To change an RS-232C setting through the front panel,

Step 1 : Press MODE,

Step 2 : Select the REMOTE menu choice,

Step 3 : Select the desired settings,

Step 4 : Press ENTER,

10.3 INTERFACE HARDWARE/ HANDSHAKING CONSIDERATIONS

The remote interface consists of a 25 pin female D-type connector located on the rear panel. When using the RS-232C remote interface, connect the controller to the ST-103 rear-panel connector with an appropriate 25 pin cable.

The ST-103 is configured as an RS-232C Data Circuit terminating Equipment (DCE). For a local (direct) connection to a DTE device (most RS-232C controllers), connect the controller to the ST-103 with a straight (non-null modem) cable.

To interface to another DCE device, a null modem is required to cross-connect signal pairs (2 & 3, 4 & 5, and 6 & 20). Refer to Table 10.1 for RS-232C signal names, pinouts, and functional descriptions.

Table 10.1 RS-232C Interface Connector Pin-out

PIN	NAME	FUNCTION
1	GND	Protective Ground.
2	RxD	Received Data Input. Data sent to the ST-103 is received on this input.
3	TxD	Transmitted Data Output. Data sent from the ST-103 to the terminal is transmitted on this output.
4	CTS	Clear to Send. Sent to the ST-103, a hi-level indicates that external device is ready to accept data from the unit. This pin must be high or open for the ST-103 to transmit Data. This pin is pulled high internally by 27 Kohm to +12V.
5	RTS	Request to Send. Always High.
6	DTR	Data terminal Ready. Always High.
7	GND	Signal Ground.
20	DSR	Data Set Ready. Ignored.

All OTHER PINS Not used.

10.4 INTERFACE TESTING

To test that the RS-232C interface is properly connected, attach a standard 25 pin D-type connector cable between the ST-103 RS-232C rear panel connector and the controller, with the ST-103 off. Turn on the ST-103. The following message should appear on the RS-232C controller's screen, followed by the prompt "ST103>" :

*****MICROWAVE LOGIC ST-103 RX V1.00 09/91 *****
ST103>

If the message does not appear, check the following:

1) The cable may be defective,

2) The controller may be configured as DCE equipment. A null modem may be required,

3) The controller signal format, or Baud rate may not match the ST-103's settings. Refer to the previous section "RS-232C INTERFACE DEVICE SETTINGS" for interface setting information.

10.5 PROGRAMMING REMOTE COMMANDS

There are two types of remote commands for the ST-103:

1) set commands (or commands) and,

2) queries commands (or queries).

The set commands force the ST-103 to take a specific action. The query commands direct the ST-103 to return status information.

Commands are entered one line at a time. Errors may be corrected while entering a line, with the backspace key. A command string is terminated by a carriage return, which transmits the string to the ST-103 and executes the command string. All valid commands are executed, incorrect or unsupported commands are responded to by an error message. Refer to the "ERROR MESSAGES" paragraph.

Command lines may contain a single command or multiple commands. The command line may contain both queries and commands. Individual commands within the command line must be separated by semicolons (;), parameters must be separated by commas (,) . Non-decimal numeric parameters, Hexadecimal, Octal, and Binary must be preceded by a '#H', '#Q', or '#B', respectively. Refer to the "COMMAND EXAMPLES" paragraph.

The entire command name does not have to be entered for the command to be recognized as valid. There is a minimum valid length associated with each command, which is the length that makes it unique from all other commands listed below.

Refer to Appendix A for ST-103 Rx commands.

10.6 ERROR MESSAGES

All RS-232C remote commands received by the ST-103 are checked for command validity, and appropriate parameters (parameters listed with commands within brackets [ ]). All valid command strings are executed; incorrect command strings are responded to with error messages.

ERROR MESSAGES	ERROR
"*** Input Lost"	Input data lost over interface.
"*** Input Buffer Overflow"	Input buffer overflow, command line too long without terminator.
"*** Command Mnemonic Not Found"	Command not found.
"*** Invalid Command for Interface"	Command found, but not valid for this interface.
"*** Invalid Command Type"	Command mnemonic found, but command issued incorrectly: missing, or added, '?' on end of command.
"*** Too Few Parameters"	Missing parameter.
"*** Too Many Parameters"	Too any parameters or trailing garbage at end of command.
"*** Invalid Parameter"	Parameter invalid.
"*** Parameter Out of Range"	Parameter out of range.
"*** Parameter Not in Set"	Parameter not one of the values specified for the command.

ERROR MESSAGES	ERROR
"*** Invalid String Length"	Parameter string too long.
"*** Parameter Separator"	Parameter separator, ';', is missing or command line is terminated following separator.
"*** Invalid Non-decimal Parameter"	Parameter not in a valid non-decimal format, or parameter out of the 0 to 255 decimal range.
"*** Command Execution Error"	Command not executed properly.
"*** Out of Memory"	Processor out of memory.

10.7 COMMAND EXAMPLES

COMMAND	RESPONSE
view_angle?	Returns the current Front Panel view angle.
view_angle 3	Sets the front panel LCD view angle to angle '3'.
rs_prompt 'ST-103>'	Sets the prompt to 'ST-103>'.

RECEIVER GPIB INTERFACE APPLICATION INFORMATION

11.1 REMOTE INTERFACE CAPABILITIES

The ST-103 supports remote control through the GPIB interface bus connector on the rear panel. The unit can be operated from the front panel and over the remote interface simultaneously. Any unit statue changes made remotely will be displayed on the front panel. All of the front panel functions can be controlled over the GPIB interface bus, except 'POWER'.

The remote commands sent to the ST-103 differ from front panel control. The current operating mode is entered directly rather than through sub-menus.

11.2 INTERFACE DEVICE SETTINGS

For proper GPIB Interface communication and hand-shaking, the GPIB controller (Computer or other controller), and the Device (ST-103 Rx), must have their addresses set up prior to use.

Each instrument on the GPIB interface bus must have a unique INSTRUMENT address. The INSTRUMENT address range for the ST-103 (0 TO 30 decimal) is set in the REMOTE sub-menu under the MODE menu.

The ST-103 will then respond to commands sent to that INSTRUMENT address. This will be done without affecting the remote command processing.

11.3 INTERFACE FUNCTIONS

The ST-103 is configured as a talker/listener. No controller functions are implemented. As described in the IEEE-488 GPIB standards the ST-103 supports the following implementation:

SH1	Complete source handshake.
AH1	Complete acceptor handshake.
T6	Basic talker, serial poll, no talk only, unaddressed if addressed to listen, no extended talker.
L4	Basic listener, no listen only, unaddressed if addressed to talk, no extended listener.
SR1	Complete service request.
RL1	Complete remote/local capability including local lockout.
PPO	No parallel poll capability.
DC1	Complete device clear capability.
DT0	No device trigger capability.
C0	No controller capability.
E2	Tri-state drivers used on DI0 lines for maximum data transfer rate.

11.4 CONNECTOR PIN-OUTS

The ST-103 Rx uses the standard D-type 24 pin GPIB connector located on the rear panel. All signals and pins conform to standard GPIB pin out protocol.

11.5 PROGRAMMING REMOTE COMMANDS

There are two types of remote commands for the ST-103:

1) set commands (or commands) and,

2) queries commands (or queries).

The set commands force the ST-103 to take a specific action. The query commands direct the ST-103 to return status information.

The controller sends commands to the ST-103 as strings terminated by EOI or EOI/LF character. These command lines can contain a single command or multiple commands. The command line may contain both queries and commands. Each individual command within the command line must be separated by semi-colons(;), parameters must be preceeded by a '#H'. Refer to the "COMMAND EXAMPLES" paragraph for command line examples.

Each query command sent to the ST-103 will return one response. The response may contain multiple response units (separated by semi-colons), however only one EOI/LF response termination is sent by the ST-103 to the controller for each query command.

The responses for the ST-103 commands will be either character mnemonics (Example: INT or EXT) or numerics (Example: 14). Appendix C lists all queries and specifies the query response format the command will return. If the query returns a mnemonic, the valid mnemonic will be listed.

11.6 NUMERIC RESPONSES

If the query responds with a numeric, it will be specified as one of the following types:

1) <NR1 Numeric> - decimal integer

2) <NR2 Numeric> - decimal real number without exponent

3) <NR3 Numeric> - decimal real number with exponent

4) <Non-decimal Numeric> - non-decimal number with leading '#H' (Hex), '#Q' (Octal), or '#B' (Binary) and always in the range of 0 to 255 decimal.

A list of the GPIB commands is provided, along with a brief description of each command, the valid parameters and the basic response format. The parameters shown within brackets '[ ]' following the command name are required.

11.7 STATUS REPORTING

There is status reporting functionality provided for the GPIB interface, which is based on the service request (SRQ) and is fully defined in the ANSI/IEEE standard 488.2-1987. The implementation used by the ST-103 for status reporting includes one additional register form what is specified within the IEEE 488.2 standard.

STATUS BYTE

There is a status byte which is used to determine the SRQ status. The individual bits within the status byte represent the different conditions which might cause the request for service, defined as follows:

Bits 1 to 3: Unused

Bit 4 : (TSB) Test Event Status Bit

Bit 5 : (MAV) Message Available Bit

Bit 6 : (ESB) Standard Event Status Bit

Bit 7 : (MSS) Master Summary Status Bit

Bit 8 : Unused

Test Event Status Bit - This is the summary of the Test Status Event Status Byte. It will be set whenever an enabled Test event condition occurs.

Message Available Bit - Set whenever there is output available for the controller.

Standard Event Status Bit - This is the summary of the Standard Event Status Byte. It will be set whenever an enabled standard event condition occurs.

Master Summary Status Bit - This is the Master Summary Status. It is a summary of the status byte, so that whenever one of the bits (TSB, MAV or ESB) is set and it is also enabled (by the Service Request Enable byte), the MSS bit will be set.

SERVICE REQUEST ENABLE

The different conditions for a service request can be individually enabled. The Service Request Enable byte contains the enabling bits for the status byte. For a service request to occur, either the TSB, MAV or ESB bit must be enabled. Each time the ST-103 is powered on, this byte is RESET so that no bits are enabled. The bit definition is the same as the status byte, except bit 7 is undefined.

SRQ

The status byte is used to create a service request. Whenever a condition occurs in the ST-103 which requires service from the controller and the condition is enabled, the SRQ (Service Request) line will be set. The SRQ will be reset after the controller finishes a serial poll of the ST-103 or when all of the enabled service request conditions have stopped.

STANDARD EVENT STATUS REGISTER

The ESB bit is the summary of the Standard Event Status Register. This byte has an enabling byte which works in a similar manner to the above Status Byte. The individual bits within the Standard Event Status Register represent the different conditions which might cause a Standard Event. The bit definitions for the Standard Event Status Register are as follows:

Bit 1 : Operation Complete

Bit 2 : Request Control

Bit 3 : Query Error

Bit 4 : Device Dependent Error

Bit 5 : Execution Error

Bit 6 : Command Error

Bit 7 : User Request

Bit 8 : Power On

Operation Complete - Only set following an *OPC command.

Request Control - Not used.

Query Error - Set under the following conditions:

- when output has been requested from the ST-103 and none is available,

- when a command is sent to the ST-103 and the ST-103 still has a message available,
- when output has been requested from the ST-103 and an unterminated command has been sent to the ST-103.

Device Dependent Error - Not used.

Execution Error - Set under the following conditions:

- when a command parameter is out of range,
- when the command has too many or too few parameters,
- when the command cannot be properly executed due to a device condition.

Command Error - Set whenever the ST-103 receives an unrecognized command, or invalid GPIB command.

User Request - Not Used.

Power On - Set whenever the ST-103 is powered on.

STANDARD EVENT STATUS ENABLE REGISTER
The different conditions within the Standard Event Status Register can be individually enabled and disabled. The Standard Event Status Enable Register contains enabling bits. Each time one of the event conditions or one of the enabling bits change, the status of the ESB bit is re-evaluated; if any status bit is set and its corresponding enable bit is set, the ESB bit will be set.

Each time the ST-103 is powered on, this byte is reset so that no bits are enabled. The bit definition for the Standard Event Status Enable Register is the same as for the Standard Event Status Register.

TEST EVENT STATUS REGISTER
The TSB bit is the summary of the Test Event Status Register. This byte has an enabling byte which works in a similar manner to the above Status Byte. The individual bits within the Test Event Status Register represent the different conditions which might cause a Test Event. The bit definitions for the Test Event Status Register are as follows:

Bit 1 : End-Of-Test Condition
Bit 2 : Auto Pattern Search Complete
Bit 3 : Remote VT Scan Complete
Bit 4 : Frame Capture Triggered
Bit 5 : Error Occurred
Bit 6 to 8 : Unused

End-Of-Test - Set at the end of each Test.

Auto Pattern Search Complete - Set following DS3 or VT1.5 Auto Pattern Search completion.

Remote VT Scan Complete - Set following VT Scan completion when initiated by remote command.

Frame Capture Triggered - Set after the Frame Capture trigger has been ARMed and the trigger occurred.

Error Occurred - Set whenever any error condition that is being monitored occurs.

TEST EVENT STATUS ENABLE REGISTER
The different conditions within the Test Event Status Register can be individually enabled and disabled. The Test Event Status Enable Register contains enabling bits. Each time one of the event conditions or one of the enabling bits change, the status of the TSB is re-evaluated; if any status bit is set and its corresponding enable bit is set, the TSB bit will be set.

Each time the ST-103 is powered on, this byte is reset so that no bits are enabled. The bit definition for the Test Event Status Enable Register is the same as for the Test Event Status Register.

GPIB COMMON COMMANDS
The following commands are provided to use with the GPIB status reporting, as defined by IEEE 488.2 for service request:

*STB?, *SRE, *SRE?, *ESR?, *ESE, *ESE?, *CLS

ADDITIONAL SRQ GPIB COMMANDS

The following commands are provided to use with the Test Status SRQ feature, as explained above:

TSE, TSE?, TSR?

11.8 COMMAND EXAMPLES

The following lists a brief example of an interactive remote session with the ST-103:

```
>VIEW_ANGLE 2
>VIEW?
  VIEW_ANGLE 2
> HEADER OFF
>VIEW 5
>VIEW_ANGLE?
  5
>HEADER ON
>VIEW_ANGLE?
  VIEW_ANGLE 5
```

To ensure proper communications with the ST-103, the Status Bytes listed under STATUS REPORTING should be used. The Status Bytes will indicate if a programming error has occurred (Ex: using the command incorrectly or trying to set the ST-103 to an invalid state). The Status Bytes can also be used to indicate when a Message is available to be read from the ST-103, which will prevent time-outs on the GPIB Bus due to reading with no message available.

Following each time the ST-103 has been sent a command, the Status Byte should be polled to determine if a condition has occured which would indicate that the command was not accepted. This requires initializing the Enable Registers to allow the desired conditions to activate the Standard Event Status Bit. Prior to reading any response from the ST-103, the Status Byte should be polled to determine if a Message is actually available to be read. No initialization is needed for this.

11.9 IEEE-488.2 PROGRAMMING MANUAL REQUIREMENTS

Certain programming requirements are specified for GPIB interfaces by the American National Standard Institute (ANSI) document, ANSI/IEEE Std 4888.2-1987, which are detailed in this section.

POWER ON SETTINGS

The ST-103 will restore the device settings to their values from when it was last powered off. There are no remote commands which will affect this. The only exception to this is when the non-volatile RAM becomes corrupted, (which should never happen during normal unit operation). RAM Corruption, if it occurs will be displayed on the units LCD display. When this happens, the ST-103 will have the default settings.

MESSAGE EXCHANGE

The following message exchange options are as follows:

- The input buffer is command line oriented. There will be a new input buffer for each command line, or program message. The input buffer has a maximum length of 80 characters.
- The only remote commands which will return more than one response message unit (responses separated by semi-colons) are the following: *lrn?, oh_all?
- All queries (commands) generate their response messages immediately when they are parsed. No queries wait until the responses are read for them to be generated.
- No commands are coupled.

FUNCTIONAL ELEMENTS

A list of the functional elements which are used by the ST-103 is required by the IEEE 488.2 standard. These are the functional elements used in constructing the remote commands that control the ST-103. For further details about this, see the IEEE 488.2 standard, sections 4.3, 7.1.1, and 7.3.3.

From Tables 4.2 and 4.3 of the IEEE 488.2 standard, the ST-103 performs the following:

<PROGRAM MESSAGE>
<PROGRAM MESSAGE TERMINATOR>
<PROGRAM MESSAGE UNIT>
<PROGRAM MESSAGE UNIT SEPARATOR>
<COMMAND MESSAGE UNIT>
<QUERY MESSAGE UNIT>
<COMMAND PROGRAM HEADER>*
<QUERY PROGRAM HEADER>*
<PROGRAM HEADER SEPARATOR>
<PROGRAM DATA SEPARATOR>
<PROGRAM DATA>
<DECIMAL NUMERIC PROGRAM DATA>
<CHARACTER PROGRAM DATA>

* <compound command program header> and <compound query program header> are not handled.

SPECIFIC COMMAND IMPLEMENTATIONS

Reset Command

The reset command, "*rst", performs a device reset. As defined in the IEEE 488.2 standard it will:

- Resets the device settings to default settings,
- Macros are not implemented in the ST-103, macros are ignored.
- Forces the ST-103 into Operation Complete Command Idle State (OCIS) and Operation Complete Query Idle State (OQIS).

Self Test Query

The scope of the self test function is limited; it tests the basic ST-103 functionality.

Overlapped vs Sequential Commands

All commands are sequential commands.

Operation Complete Message

All commands actions are immediate (no overlapped commands), such that operation complete is immediate.

MAINTENANCE AND SERVICE

13.1 MAINTENANCE

13.1.1 General

It is recommended that an annual calibration be done by returning the unit to the factory. At that time, the following operations will be completed.

TRANSMITTER	RECEIVER
Power supply cal	Power supply cal
Clock oscillator cal	Attenuator level cal
Software upgrade	Software upgrade
Output amp cal	Input sensitivity cal
Optical power out cal	Optical input range cal
System test	System test

13.1.2 AC Line Fuse Replacement

The AC line fuse is located in the AC receptacle located on the back panel. Slide the fuse cover up and using a small screw driver or other tool, pry the fuse out of the holder. Replace only with the correct fuse, a 2 AMP SLO-BLOW such as Littlefuse 3AG.

13.2 Trouble Verification

If the instrument fails to operate properly, perform the procedures detailed in Section 3.0, Preparation for Use. This will confirm whether or not the fault is in the test set. For further technical assistance, contact the Microwave Logic Customer Service Department at (508) 649-6099. Have the Serial Numbers at hand in the event that the test set needs to be returned to the factory. Follow the Repair Returns procedure described at the front of this manual.

TRANSMITTER REMOTE COMMANDS

This is the command set for the ST-103 Tx (Transmitter). All remote commands are listed here. A brief description of each command, valid parameters, and response format are included. The parameters shown within brackets '[ ]' following the command name are required. The commands are separated into seven functional groups, listed in the following order.

GROUP	FUNCTION
1 Mode Commands	Mode and setup control
2 SPE/DSX Commands	SPE/DSX Mapping and payload
3 Pointer Commands	Pointer control and pre-defined Tests
4 TOH/POH Commands	Transport/Path OverHead edit
5 Error Commands	Error generation control
6 Miscellaneous	Miscellaneous commands
7 Common Commands	Common Commands defined by IEEE-488.2

The commands listed on the following pages show the command name and the valid parameters. The examples which are shown with the commands demonstrate the command format. In the examples and in the response lists, the upper case denotes what is returned from the ST-103, where lower case denotes what is sent to the ST-103.

In all of the examples, the full command name is sent to the ST-103. This is not necessary. For any command, all that is needed is enough to make it unique. All parameters, which are specified within brackets '[ ]', must be entered exactly as shown in the brackets.

A.1 MODE COMMANDS

COMMAND: ds1_sync [dsx1,ds1clk]

ACTION: Sets the DS1 Clock Synchronization signal, which is used in the payload and STS clock synchronizations:

dsx1 - Clock Recovery from the DSX-1 data input is used for sync.

ds1clk - DS1 Clock input is used for clock synchronization.

Example: ds1_sync dsx1

COMMAND: ds1_sync?

ACTION: Returns the DS Clock Sync. signal.

Response: DSX1 or DS1CLK.

Example: ds1_sync?
DS1_SYNC DS1CLK

COMMAND: dsx1_code [ami,b8zs]

ACTION: Sets the DSX-1 Line Coding:

ami - DSX-1 Line Code is AMI.
b8zs - DSX-1 Line Code is B8ZS.

Example: dsx1_code ami

COMMAND: dsx1_code?

ACTION: Returns the DSX-1 Line Coding.

Response: AMI or B8ZS.

Example: dsx1_code?
DSX1_CODE B8ZS

COMMAND: edit_setup [n],[s]

ACTION: This command allows changes to the text descriptions of any of the 10 user setup locations. The setup at location 'n' will have the description 's':

'n' : 0 to 9
's' : an ASCII string with a maximum length of 25 characters

Example: edit_setup 3 , 'STS-12 TEST'

COMMAND: edit_setup? [n]

ACTION: Returns the text description of the 'n' user setup locations.

'n' : 0 to 9
Response: <String Response>

Example: edit_setup? 3
EDIT_SETUP 3 , 'OC12 TEST 123'

COMMAND: gpib_address [v]

ACTION: Sets the GPIB Address to 'v':

0 to 30
(allowed by RS-232 interface only)

Example: gpib_address 14

COMMAND: gpib_address?

ACTION: Returns the current GPIB Address.

Response: <NR1 Numeric>
(allowed by RS-232 interface only)

Example: gpib_address?
GPIB_ADDRESS 15

COMMAND: gpib_bus [talk_listen,off_bus]

ACTION: Sets the ST-103 GPIB Bus control. When set to OFF-BUS, it will not communicate over the GPIB bus.

talk_listen - Communicates over BUS.
off_bus - No GPIB Communication
(allowed by RS-232 interface only)

Example: gpib_bus talk_listen

COMMAND: gpib_bus?

ACTION: Returns the GPIB Bus control status.

Response: TALK_LISTEN or OFF_BUS
(allowed by RS-232 interface only)

Example: gpib_bus?
GPIB_BUS OFF_BUS

COMMAND: opt_output [on,off]

ACTION: Controls the optical output. Can only be controlled if the optical option is installed.

off - Disables the Optical output, the lasers are turned off.

on - Enables the Optical output at the signal level specified by SIGNAL (STS-3 or STS-12).

Example: opt_output on

COMMAND: opt_output?

ACTION: Returns the optical output setting.

Response: ON or OFF.

Example: opt_output?
OPT_OUTPUT OFF

COMMAND: options?

ACTION: Returns the options in the ST-103.

Response: STS12
or NONE.

Example: options?
OPTIONS STS12

COMMAND: output_level [n]

ACTION: Sets the DSX-3/STSX-1 output level to 'n' dBr:

-6 to 6 , in steps of 1 dBr.

Example: output_level 5

COMMAND: output_level?

ACTION: Returns the DSX-3/STSX-1 output level.

Response: <NR1 Numeric>.

Example: output_level?
OUTPUT_LEVEL -3

COMMAND: psync_byte [s]

ACTION: Sets the Programmable Sync Byte to 's', where 's' is an ASCII string containing a mnemonic indicating an overhead byte. The following is a list of the valid mnemonics for the overhead bytes:

A1	A2	C1	J1
B1	E1	F1	B3
D1	D2	D3	C2
H1	H2	H3	G1
B2	K1	K2	F2
D4	D5	D6	H4
D7	D8	D9	Z3
D10	D11	D12	Z4
Z1	Z2	E2	Z5

Example command: psync_byte 'J1'

COMMAND: psync_byte?

ACTION: Returns the Prog. Sync byte mnemonic.

Response: String containing one of the above mnemonics.

Example: psync_byte?
PSYNC_BYTE 'D12'

NOTE: 'SPE' will be returned if the Prog. Sync byte has been programmed by offset and is not an overhead byte.

COMMAND: psync_offset [n]

ACTION: Sets the Programmable Sync Byte to 'n' bytes following the J1 byte in the SPE.

0 to 782

Example: psync_offset 654

COMMAND: psync_offset?

ACTION: Returns the Prog. Sync byte offset.

Response: <NR1 Numeric>

Example: psync_offset?
PSYNC_OFFSET 12

NOTE: -1 will be returned if the Prog. Sync byte has been programmed by mnemonic and is not in the SPE.

COMMAND: pyld_sync [async,ds1,sts]

ACTION: Sets the VT/DS3 Clock Synchronization mode:

async- Internal Clock used for VT/DS3 synchronization.

ds1 - VT/DS3 Output synchronous to Clock Recovery from DSX-1 input or to DS1 Clock input (see ds1_sync).

sts - Vt/DS3 Output synchronous to SONET output (see sts_sync).

Example: pyld_sync async

COMMAND: pyld_sync?

ACTION: Returns the VT/DS3 Clock Sync. mode.

Response: ASYNC , DS1 or STS.

Example: pyld_sync?
PYLD_SYNC ASYNC

COMMAND: quick_setup [n]

ACTION: This command recalls a quick setup from one of the pre-defined setups. There are a total of 9 pre-defined setups. See Appendix B for the details on the pre-defined setups. The setup at location 'n' is recalled:

0 to 8,

where 'n' corresponds the the quick setups as follows:

0 - 'STSX-1, DS3 PAYLOAD'
1 - 'STSX-1, VT1.5 PAYLOAD'
2 - 'OC3, DS3 PAYLOAD'
3 - 'OC3, VT1.5 PAYLOAD'
4 - 'DSX-3 OUTPUT MODE'
5 - 'DSX-1 OUTPUT MODE'
6 - 'OC12, DS3 PAYLOAD'
7 - 'OC12, VT1.5 PAYLOAD'
8 - 'MASTER DEFAULT'

Example: quick_setup 3

COMMAND: recall_setup [n]

ACTION: This command recalls a setup from one of setup locations. There are 10 user setup storage locations. The setup at location 'n' is recalled:

0 to 9

Example: recall_setup 8

Note: Only those setup locations with stored setups can be recalled (see stored?).

COMMAND: save_setup [n]

ACTION: This command takes the current setup of ST-103 and stores it into a setup storage location. There are 10 user setup storage locations. The setup is stored at 'n':

0 to 9

Example: save_setup 3

COMMAND: signal [sts1,sts3,sts12,dsx3]

ACTION: Sets the STS-N or DSX signal rate used for error inject and controls the optical output signal rate:

sts1 - Error testing will be done at the STS-1 signal level.

sts3 - Error testing will be done at the STS-3 signal level and if optics are installed and enabled, the output signal rate will be OC3.

sts12 - Error testing will be done at the STS-12 signal level and if optics are installed and enabled, the output signal rate will be OC12.

dsx3 - Error testing will be done at the DSX-3 signal level.

Example: signal dsx3

COMMAND: signal?

ACTION: Returns the signal rate.

Response: STS1, STS3, STS12, or DSX3.

Example: signal?
SIGNAL STS3

COMMAND: stored?

ACTION: Returns all of the user setup locations which contain stored setups.

Response: <NR1 Numeric (s) >

Example: stored?

STORED 0,5,8

COMMAND: sts1_scram [on,off]

ACTION: Controls the STS-1 Scrambler.

on - STS-1 output scrambled.

off - STS-1 output not scrambled.

Example: sts1_scram on

NOTE: This does not control the OC3/OC12 output which NEVER scrambles STS-1.

COMMAND: sts1_scram?

ACTION: Returns the STS-1 Scrambler setting.

Response: ON or OFF.

Example: sts1_scram?

STS1_SCRAM OFF

COMMAND: sts_sync [sts1,sts3,sts12,ds,async]

ACTION: Sets the STS/OC Clock Sync. mode:

sts1 - STS/OC Output synchronous to STS-1 Clock input.

sts3 - STS/OC Output synchronous to STS-3 Clock input.

sts12 - STS/OC Output synchronous to STS-12 Clock input. (Can only be selected if STS-12 option is installed).

ds - STS/OC Output synchronous to Clock Recovery from DSX-1 input or to DS1 Clock input. (see ds_sync)

async - Internal Clock used.

Example: sts_sync ds

COMMAND: sts_sync?

ACTION: Returns the STS/OC Clock Sync. mode.

Response: STS1, STS3, STS12, DS or ASYNC

Example: sts_sync?

STS_SYNC STS12

COMMAND: view_angle [n]

ACTION: Sets the front panel display view angle to 'n':

0 to 15

Example: view_angle 12

COMMAND: view_angle?

ACTON: Returns the current display view angle.

Response: <NR1 Numeric>

Example: view_angle?

VIEW_ANGLE 3

A.2 SPE/DSX COMMANDS

COMMAND: ds3_alarms [off,xbit,ais,idle]

ACTION: Sets the DS3 payload to include alarm as follows:

off - No alarms included in payload.

xbit - X-Bit alarm set in payload.

ais - Payload switched to Framed 8-Bit pattern of 'AA'.

idle - Payload switched to Framed 8-Bit pattern of 'CC'.

Example: ds3_alarms idle

NOTE: After switching out of the AIS or IDLE alarms the previous framing and pattern settings are restored.

COMMAND: ds3_alarms?

ACTION: Returns the current DS3 Alarm setting.

Response: OFF , XBIT , AIS or IDLE.

Example: ds3_alarms?

DS3_ALARMS XBIT

COMMAND: ds3_framing [m13,cbit,unframed]

ACTION: Sets the DS3 framing mode:

m13 - DS3 in M13 framing mode.

cbit - DS3 in C-BIT framing mode.

unframed - DS3 in unframed mode.

Example: ds3_framing cbit

COMMAND: ds3_framing?

ACTION: Returns the DS3 framing mode.

Response: M13 , CBIT or UNFRAMED.

Example: ds3_framing?
DS3_FRAMING UNFRAMED

COMMAND: ds3_pattern [prbs,word]

ACTION: Sets the internally generated data pattern for the DS3 payload as follows:

word- User specified 8-bit pattern.

prbs - 2E15 INV PRBS data pattern.

Example: ds3_pattern prbs

COMMAND: ds3_pattern?

ACTION: Returns the internally generated data pattern for the DS3 payload.

Response: PRBS or WORD.

Example: ds3_pattern?
DS3_PATTERN WORD

COMMAND: ds3_pyld [int,ext]

ACTION: Sets the data pattern source for the DS3 payload:

int - Internally generated pattern.

ext - Externally generated data pattern from the DSX-3 input.

Example: ds3_pyld int

COMMAND: ds3_pyld?

ACTION: Returns the DS3 data pattern source.

Response: INT or EXT.

Example: ds3_pyld?
DS3_PYLD EXT

COMMAND: ds3_word [b1]

ACTION: Sets the user specified DS3 8-Bit data pattern to 'b1':

'b1': #H00 to #HFF, (Hex)
or #Q000 to #Q377, (Octal)
or #B0 to #B11111111 (Binary)

Example: ds3_word #haa

NOTE: See Section 7.0 for details on programming with non-decimal numbers.

COMMAND: ds3_word?

ACTION: Returns the user specified DS3 8-Bit data pattern.

Response: <Non-Decimal Numeric>

Example: ds3_word?
DS3_WORD #H0E

COMMAND: pyld_enab [vt,ds3]

ACTION: Sets the payload type to be contained in the STS-1 payload being transmitted:

vt - VT1.5 payload enabled.

ds3 - DS3 payload enabled.

Example: pyld_enab vt

COMMAND: pyld_enab?

ACTION: Returns the payload type in the STS-1.

Response: VT or DS3.

Example: pyld_enab?
PYLD_ENAB DS3

COMMAND: vt_channel [n]

ACTION: Sets the VT1.5 channel, which will have a user specified payload, to 'n':

1 to 28

Example: vt_channel 23

NOTE: All of the other 27 channels will have a pre-defined 24-bit payload.

COMMAND: vt_channel?

ACTION: Returns the user controlled VT1.5 channel.

Response: <NR1 Numeric>

Example: vt_channel?
VT_CHANNEL 5

COMMAND: vt_framing [unframed,d4]

ACTION: Sets the VT1.5 framing mode:

unframed - VT1.5 is unframed.

d4 - VT1.5 is framed as D4.

Example: vt_framing d4

COMMAND: vt_framing?

ACTION: Returns the VT1.5 framing mode:

Response: UNFRAMED or D4.

Example: vt_framing?
VT_FRAMING UNFRAMED

COMMAND: vt_mapping [locked,floating]

ACTION: Sets the VT mode for mapping into the VT1.5 payload:

locked - Locked VT Mode.
floating - Floating VT Mode.

Example: vt_mapping floating

COMMAND: vt_mapping?

ACTION: Returns the VT mode for mapping into the VT1.5 payload:

Response: LOCKED or FLOATING

Example: vt_mapping?
VT_MAPPING LOCKED

COMMAND: vt_pattern [word,prbs_9,prbs_15,prbs_20,prbs_23,qrw]

ACTION: Sets the internally generated data pattern for the specified VT1.5 as follows:

word - User specified 24-bit pattern.
prbs_9 - 2E9 PRBS data pattern.
prbs_15 - 2E15 PRBS data pattern.
prbs_20 - 2E20 PRBS data pattern.
prbs_23 - 2E23 PRBS data pattern.
qrw - Quasi-random data pattern, 2E20 with a maximum of 14 0's.

Example: vt_pattern prbs_9

COMMAND: vt_pattern?

ACTION: Returns the internally generated data pattern for the specified VT1.5.

Response: WORD , PRBS_9 , PRBS_15 , PRBS_20 , PRBS_23 or QRW.

Example: vt_pattern?
VT_PATTERN QRW

COMMAND: vt_pyld [int,ext]

ACTION: Sets the data pattern source for the specified VT1.5 channel:

int - Internally generated pattern.
ext - Externally generated data pattern from the DSX-1 input.

Example: vt_pyld int

COMMAND: vt_pyld?

ACTION: Returns the VT1.5 data pattern source.

Response: INT or EXT.

Example: vt_pyld?
VT_PYLD EXT

COMMAND: vt_v5 [n]

ACTION: Sets the VT1.5 OverHead byte V5 to 'n'.

0 to 63

Example: vt_v5 32

COMMAND: vt_v5?

ACTION: Returns the value of the VT1.5 OverHead byte V5 for the specified channel.

Response: <NR1 Numeric>

Example: vt_v5 32
VT_V5 2

COMMAND: vt_word [b1,b2,b3]

ACTION: Sets the user specified 24-Bit data pattern to 'b1' , 'b2' , 'b3', where 'b1' is the most significant byte and 'b3' is the least:

'b1','b2','b3': #H00 to #HFF, (Hex)
or #Q000 to #Q377, (Octal)
or #B0 to #B11111111 (Binary)

Example: vt_word #haa,#h55,#haa

NOTE: See Section 7.0 for details on programming with non-decimal numbers.

COMMAND: vt_word?

ACTION: Returns the user specified 24-Bit data pattern.

Response: <Non-Decimal Numerics>

Example: vt_word?
VT_WORD #H00,#HFF,#HE2

A.3 POINTER COMMANDS

COMMAND: spe_add_int [n]

ACTION: Sets the Interval time for the pre-defined SPE Periodic with Addition test to 'n' seconds:

0.002 to 16.383, in steps of 0.001

In the pre-defined SPE Periodic tests, this is the time between the PJs. In the pre-defined SPE Burst Pointer test, this is set to 0.5 milliseconds.

Example: spe_add_int 0.125

COMMAND: spe_add_int?

ACTION: Returns the SPE Interval time for the pre-defined SPE Periodic with Addition test.

Response: <NR2 Numeric>

Example: spe_add_int?
SPE_ADD_INT 0.005

COMMAND: spe_add_per [n]

ACTION: Sets the Measurement Period used in the pre-defined SPE Periodic with Addition test to 'n' seconds:

1 to 999

In the pre-defined SPE Periodic with Addition, this is the time between the additional PJs.

Example: spe_add_per 3

COMMAND: spe_add_per?

ACTION: Returns the SPE Measurement Period for the pre-defined SPE Periodic with Addition test.

Response: <NR1 Numeric>

Example: spe_add_per?
SPE_ADD_PER 10

COMMAND: spe_add_pol [neg,pos,ext]

ACTION: Sets the polarity of the SPE Pointer Justification, used in the pre-defined SPE Periodic with Addition test, as follows:

neg - Each PJ will be negative.

pos - Each PJ will be positive.

ext - PJ polarity will be determined by the external polarity input.

Example: spe_add_pol pos

COMMAND: spe_add_pol?

ACTION: Returns the SPE PJ polarity used for the pre-defined SPE Periodic with Addition test.

Response: NEG , POS or EXT.

Example: spe_add_pol?
SPE_ADD_POL NEG

COMMAND: spe_add_test [n]

ACTION: Sets the number of Measurement periods, of which the pre-defined SPE Periodic with Addition test consists, to 'n':

0 to 9999,

where a value of 0 means continuous.

Example: spe_add_test 10

COMMAND: spe_add_test?

ACTION: Returns the number of SPE Measurement periods for the pre-defined SPE Periodic with Addition test.

Response: <NR1 Numeric>

Example: spe_add_test?
SPE_ADD_TEST 5

COMMAND: spe_add_time [n]

ACTION: Sets the Initialization time used in the pre-defined SPE Periodic with Addition test to 'n' seconds:

1 to 999

Example: spe_add_time 14

COMMAND: spe_add_time?

ACTION: Returns the pre-defined SPE Periodic with Addition test Initialization time.

Response: <NR1 Numeric>

Example: spe_add_time?
SPE_ADD_TIME 2

COMMAND: spe_bur_per [n]

ACTION: Sets the Measurement Period used in the pre-defined SPE Burst Pointer test to 'n' seconds:

1 to 999

In the pre-defined SPE Burst Pointer test, this is the time between the 3 PJs.

Example: spe_bur_per 3

COMMAND: spe_bur_per?

ACTION: Returns the SPE Measurement Period for the pre-defined SPE Burst Pointer test.

Response: <NR1 Numeric>

Example: spe_bur_per?
SPE_BUR_PER 10

COMMAND: spe_bur_pol [neg,pos,ext]

ACTION: Sets the polarity of the SPE Pointer Justification, used in the pre-defined SPE Burst Pointer test, as follows:

neg - Each PJ will be negative.

pos - Each PJ will be positive.

ext - PJ polarity will be determined by the external polarity input.

Example: spe_bur_pol pos

COMMAND: spe_bur_pol?

ACTION: Returns the SPE PJ polarity used for the pre-defined SPE Burst Pointer test.

Response: NEG , POS or EXT.

Example: spe_bur_pol?
SPE_BUR_POL NEG

COMMAND: spe_bur_test [n]

ACTION: Sets the number of Measurement periods, of which the pre-defined SPE Burst Pointer test consists to 'n':

0 to 9999,

where a value of 0 means continuous.

Example: spe_bur_test 10

COMMAND: spe_bur_test?

ACTION: Returns the number of SPE Measurement periods for the pre-defined SPE Burst Pointer test.

Response: <NR1 Numeric>

Example: spe_bur_test?
SPE_BUR_TEST 5

COMMAND: spe_bur_time [n]

ACTION: Sets the Initialization time used in the pre-defined SPE Burst Pointer test to 'n' seconds:

1 to 999

Example: spe_bur_time 14

COMMAND: spe_bur_time?

ACTION: Returns the pre-defined SPE Burst Pointer test initialization time.

Response: <NR1 Numeric>

Example: spe_bur_time?
SPE_BUR_TIME 2

COMMAND: spe_burst [n]

ACTION: Sets the number of Pointer Justifications, which will be done in the user defined SPE test in Burst mode, to 'n':

0 to 255

Example: spe_burst 23

COMMAND: spe_burst?

ACTION: Returns the SPE PJ burst count.

Response: <NR1 Numeric>.

Example: spe_burst?
SPE_BURST 55

COMMAND: spe_can_int [n]

ACTION: Sets the Interval time for the pre-defined SPE Periodic with Cancel test to 'n' seconds:

0.002 to 16.383, in steps of 0.001

In the pre-defined SPE Periodic tests, this is the time between the PJs. In the pre-defined SPE Burst Pointer test, this is set to 0.5 milliseconds.

Example: spe_can_int 0.125

COMMAND: spe_can_int?

ACTION: Returns the SPE Interval time for the pre-defined SPE Periodic with Cancel test.

Response: <NR2 Numeric>

Example: spe_can_int?
SPE_CAN_INT 5E-3

COMMAND: spe_can_per [n]

ACTION: Sets the Measurement Period used in the pre-defined SPE Periodic with Cancel test to 'n' seconds:

1 to 999

In the pre-defined SPE Periodic with Cancel, this is the time between the cancelled PJs.

Example: spe_can_per 3

COMMAND: spe_can_per?

ACTION: Returns the SPE Measurement Period for the pre-defined SPE Periodic with Cancel test.

Response: <NR1 Numeric>

Example: spe_can_per?
SPE_CAN_PER 10

COMMAND: spe_can_pol [neg,pos,ext]

ACTION: Sets the polarity of the SPE Pointer Justification, used in the pre-defined SPE Periodic with Cancel test, as follows:

neg - Each PJ will be negative.

pos - Each PJ will be positive.

ext - PJ polarity will be determined by the external polarity input.

Example: spe_can_pol pos

COMMAND: spe_can_pol?

ACTION: Returns the SPE PJ polarity used for the pre-defined SPE Periodic with Cancel test.

Response: NEG , POS or EXT.

Example: spe_can_pol?
SPE_CAN_POL NEG

COMMAND: spe_can_test [n]

ACTION: Sets the number of Measurement periods, of which the pre-defined SPE Periodic with Cancel test consists, to 'n':

0 to 9999,

where a value of 0 means continuous.

Example: spe_can_test 10

COMMAND: spe_can_test?

ACTION: Returns the number of SPE Measurement periods for the pre-defined SPE Periodic with Cancel test.

Response: <NR1 Numeric>

Example: spe_can_test?
SPE_CAN_TEST 5

COMMAND: spe_can_time [n]

ACTION: Sets the Initialization time used in the pre-defined SPE Periodic with Cancel test to 'n' seconds:

1 to 999

Example: spe_can_time 14

COMMAND: spe_can_time?

ACTION: Returns the pre-defined SPE Periodic with Cancel test Initialization time.

Response: <NR1 Numeric>

Example: spe_can_time?
SPE_CAN_TIME 2

COMMAND: spe_frames [n]

ACTION: Sets the SPE PJ interval used in the user defined SPE test. The interval is specified as once every 'n' frames:

3 to 131071

Example: spe_frames 34

COMMAND: spe_frames?

ACTION: Returns the SPE PJ frame interval.

Response: <NR1 Numeric>

Example: spe_frames?
SPE_FRAMES 12

COMMAND: spe_mode [burst,cont]

ACTION: Sets the SPE Pointer Justification stuff mode. This is used in the user defined SPE Pointer test.

burst - SPE Pointer will be adjusted a number of times (see spe_burst).

cont - SPE Pointer will be continually adjusted until the test is turned off using spe_test.

Example: spe_mode burst

NOTE: The pointer will be adjusted at the specified interval and polarity.

COMMAND: spe_mode?

ACTION: Returns the SPE PJ stuff mode.

Response: BURST or CONT.

Example: spe_mode?
SPE_MODE CONT

COMMAND: spe_ndf

ACTION: Send a SPE/NDF along with the SPE pointer specified by the spe_ptr_ndf command.

Example: spe_ndf

COMMAND: spe_pointer?

ACTION: Returns the current SPE Pointer.

Response: <NR1 Numeric>

Example: spe_pointer?
SPE_POINTER 522

COMMAND: spe_polar [neg,pos,ext]

ACTION: Sets the polarity of the SPE Pointer Justification, used in the user defined SPE Pointer test, as follows:

neg - Each PJ will be negative.

pos - Each PJ will be positive.

ext - PJ polarity will be determined by the external polarity input.

Example: spe_polar pos

COMMAND: spe_polar?

ACTION: Returns the SPE PJ polarity for the user defined SPE Pointer test.

Response: NEG , POS or EXT.

Example: spe_polar?
SPE_POLAR NEG

COMMAND: spe_ptr_ndf[n]

ACTION: Sets the SPE Pointer to 'n' which is used for the SPE NDF:

0 to 782

Example: spe_ptr_ndf 102

COMMAND: spe_ptr_ndf?

ACTION: Returns the SPE NDF Pointer.

Responmse: <NR1 Numeric>

Example: spe_ptr_ndf?
SPE_PTR_NDF 522

COMMAND: spe_single [neg,pos]

ACTION: Changes the SPE Pointer using a single-Pointer Justification:

neg - Decrements the SPE Pointer using a negative PJ.

pos - Increments the SPE Pointer using a positive PJ.

Example: spe_single pos

COMMAND: spe_test [off,spe,spe_bur,spe_add,spe_can]

ACTION: This controls the SPE Pointer testing, mode:

off - All Pointer tests are off.

spe - Starts the user defined SPE Pointer test.

spe_bur - Starts the pre-defined SPE Burst Pointer test.

spe_add - Starts the pre-defined SPE Periodic with Addition test.

spe_can - Starts the pre-defined SPE Periodic with Cancel test.

Example: spe_test spe_can

NOTE: Before starting these tests, the following must be set:

Payload Source Internal

Payload Sync set to SONET Clock

COMMAND: spe_test?

ACTION: Returns the SPE Pointer testng mode.

Response: OFF , SPE , SPE_BUR , SPE_ADD or SPE_CAN

Example: spe_test?
SPE_TEST OFF

NOTE: The value OFF is returned after the test has completed.

COMMAND: vt_add_int [n]

ACTION: Sets the Interval time for the pre-defined VT Periodic with Addition test to 'n' seconds:

0.002 to 32.767, in steps of 0.001

In the pre-defined VT Burst Pointer test, this is set to 0.5 milliseconds.

Example: vt_add_int 0.001

COMMAND: vt_add_int?

ACTION: Returns the VT Interval time for the pre-defined VT Periodic with Addition test.

Response: <NR2 Numeric>

Example: vt_add_int?
VT_ADD_INT 25E-3

COMMAND: vt_add_per [n]

ACTION: Sets the Measurement Period used in the pre-defined VT Periodic with Addition test to 'n' seconds:

1 to 999

In the pre-defined VT Periodic with Addition, this is the time between the additional PJs.

Example: vt_add_per 2

COMMAND: vt_add_per?

ACTION: Returns the VT Measurement Period for the pre-defined VT Periodic with Addition test.

Response: <NR1 Numeric>

Example: vt_add_per?
VT_ADD_PER 21

COMMAND: vt_add_pol [neg,pos]

ACTION: Sets the polarity of the VT Pointer Justification, used in the pre-defined VT Periodic with Addition test, as follows:

neg - Each PJ will be negative.

pos - Each PJ will be positive.

Example: vt_add_pol neg

COMMAND: vt_add_pol?

ACTION: Returns the VT PJ polarity for the pre-defined VT Periodic with Addition test.

Response: NEG or POS.

Example: vt_add_pol?
VT_ADD_POL POS

COMMAND: vt_add_test [n]

ACTION: Sets the number of Measurement periods, of which the pre-defined VT Periodic with Addition test consists, to 'n':

0 to 9999,

where a value of 0 means continuous.

Example: vt_add_test 10

COMMAND: vt_add_test?

ACTION: Returns the number of VT Measurement periods for the pre-defined VT Periodic with Addition test.

Response: <NR1 Numeric>

Example: vt_add_test?
VT_ADD_TEST 25

COMMAND: vt_add_time [n]

ACTION: Sets the Initialization time used in the pre-defined VT Periodic with Addition test to 'n' seconds:

1 to 999

Example: vt_add_time 1

COMMAND: vt_add_time?

ACTION: Returns the VT Initialization time for the pre-defined VT Periodic with Addition test.

Response: <NR1 Numeric>

Example: vt_add_time?
VT_ADD_TIME 31

COMMAND: vt_bur_per [n]

ACTION: Sets the Measurement Period used in the pre-defined VT Burst Pointer test to 'n' seconds:

1 to 999

In the pre-defined VT Burst Pointer test, this is the time between the 3 PJs.

Example: vt_bur_per 2

COMMAND: vt_bur_per?

ACTION: Returns the VT Measurement Period for the pre-defined VT Burst Pointer test.

Response: <NR1 Numeric>

Example: vt_bur_per?
VT_BUR_PER 21

COMMAND: vt_bur_pol [neg,pos]

ACTION: Sets the polarity of the VT Pointer Justification, used in the pre-defined VT Burst Pointer test, as follows:

neg - Each PJ will be negative.

pos - Each PJ will be positive.

Example: vt_bur_pol neg

COMMAND: vt_bur_pol?

ACTION: Returns the VT PJ polarity for the pre-defined VT Burst Pointer test.

Response: NEG or POS.

Example: vt_bur_pol?
VT_BUR_POL POS

COMMAND: vt_bur_test [n]

ACTION: Sets the number of Measurement periods, of which the pre-defined VT Burst Pointer test consists, to 'n':

0 to 9999,

where a value of 0 means continuous.

Example: vt_bur_test 10

COMMAND: vt_bur_test?

ACTION: Returns the number of VT Measurement periods for the pre-defined VT Burst Pointer test.

Response: <NR1 Numeric>

Example: vt_bur_test?
VT_BUR_TEST 25

COMMAND: vt_bur_time [n]

ACTION: Sets the Initialization time used in the pre-defined VT Burst Pointer test to 'n' seconds:

1 to 999

Example: vt_bur_time 1

COMMAND: vt_bur_time?

ACTION: Returns the VT Initialization time for the pre-defined VT Burst Pointer test.

Response: <NR1 Numeric>

Example: vt_bur_time?
VT_BUR_TIME 31

COMMAND: vt_burst [n]

ACTION: Sets the number of Pointer Justifications, which will be done in the user defined VT test in Burst mode, to 'n':

0 to 255

Example: vt_burst 12

COMMAND: vt_burst?

ACTION: Returns the VT PJ burst count.

Response: <NR1 Numeric>.

Example: vt_burst?
VT_BURST 5

COMMAND: vt_can_int [n]

ACTION: Sets the Interval time for the pre-defined VT Periodic with Cancel test to 'n' seconds:

0.002 to 32.767, in steps of 0.001

In the pre-defined VT Burst Pointer test, this is set to 0.5 milliseconds.

Example: vt_can_int 0.001

COMMAND: vt_can_int?

ACTION: Returns the VT Interval time for the pre-defined VT Periodic with Cancel test.

Response: <NR2 Numeric>

Example: vt_can_int?
VT_CAN_INT 25E-3

COMMAND: vt_can_per [n]

ACTION: Sets the Measurement Period used in the pre-defined VT Periodic with Cancel test to 'n' seconds:

1 to 999

In the pre-defined VT Periodic with Cancel, this is the time between the cancelled PJs.

Example: vt_can_per 2

COMMAND: vt_can_per?

ACTION: Returns the VT Measurement Period for the pre-defined VT Periodic with Cancel test.

Response: <NR1 Numeric>

Example: vt_can_per?
VT_CAN_PER 21

COMMAND: vt_can_pol [neg,pos]

ACTION: Sets the polarity of the VT Pointer Justification, used in the pre-defined VT Periodic with Cancel test, as follows:

neg - Each PJ will be negative.

pos - Each PJ will be positive.

Example: vt_can_pol neg

COMMAND: vt_can_pol?

ACTION: Returns the VT PJ polarity for the pre-defined VT Periodic with Cancel test.

Response: NEG or POS.

Example: vt_can_pol?
VT_CAN_POL POS

COMMAND: vt_can_test [n]

ACTION: Sets the number of Measurement periods, of which the pre-defined VT Periodic with Cancel test consists, to 'n':

0 to 9999,

where a value of 0 means continuous.

Example: vt_can_test 10

COMMAND: vt_can_test?

ACTION: Returns the number of VT Measurement periods for the pre-defined VT Periodic with Cancel test.

Response: <NR1 Numeric>

Example: vt_can_test?
VT_CAN_TEST 25

COMMAND: vt_can_time [n]

ACTION: Sets the Initialization time used in the pre-defined VT Periodic with Cancel test to 'n' seconds:

1 to 999

Example: vt_can_time 1

COMMAND: vt_can_time?

ACTION: Returns the VT Initialization time for the pre-defined VT Periodic with Cancel test.

Response: <NR1 Numeric>

Example: vt_can_time?
VT_CAN_TIME 31

COMMAND: vt_frames [n]

ACTION: Sets the VT PJ interval used in the user defined VT test. The interval is specified as once every 'n' multiframes:

2 to 65535

Example: vt_frames 17

COMMAND: vt_frames?

ACTION: Returns the VT PJ frame interval.

Response: <NR1 Numeric>

Example: vt_frames?
VT_FRAMES 12

COMMAND: vt_mode [burst,cont]

ACTION: Sets the VT Pointer Justification stuff mode. This is used in the user defined VT Pointer test.

burst - VT Pointer will be adjusted a number of times (see vt_burst).

cont - VT Pointer will be continually adjusted until the test is turned off using vt_test.

Example: vt_mode cont

NOTE: The pointer will be adjusted at the specified interval and polarity.

COMMAND: vt_mode?

ACTION: Returns the VT PJ stuff mode.

Response: BURST or CONT.

Example: vt_mode?
VT_MODE BURST

COMMAND: vt_ndf

ACTION: Sends a VT/NDF along with the VT pointer specified by the vt_ptr_ndf command.

Example: vt_ndf

COMMAND: vt_pointer?

ACTION: Returns the current VT Pointer.

Response: <NR1 Numeric>

Example: vt_pointer?
VT_POINTER 5

COMMAND: vt_polar [neg,pos]

ACTION: Sets the polarity of the VT Pointer Justification, used in the user defined VT Pointer test, as follows:

neg - Each PJ will be negative.

pos - Each PJ will be positive.

Example: vt_polar neg

COMMAND: vt_polar?

ACTION: Returns the VT PJ polarity for the user defined VT Pointer test.

Response: NEG or POS.

Example: vt_polar?
VT_POLAR POS

COMMAND: vt_ptr_ndf (n)

ACTION: Sets the VT Pointer to 'n' which is used for the VT NDF:

0 to 103

Example: vt_ptr_ndf 102

COMMAND: vt_ ptr_ndf?

ACTION: Returns the VT NDF Pointer.

Response: <NR1 Numeric>

Example : vt_ptr_ndf?
VT_PTR_NDF22

COMMAND: vt_single [neg,pos]

ACTION: Changes the VT Pointer using a single Pointer Justification:

neg - Decrements the VT Pointer using a negative PJ.

pos - Increments the VT Pointer using a positive PJ.

Example: vt_single pos

COMMAND: vt_test [off,vt,vt_bur,vt_add,vt_can]

ACTION: This controls the VT Pointer testing mode:

off - All Pointer tests are off.

vt - Starts the user defined VT Pointer test.

vt_bur - Starts the pre-defined VT Burst Pointer test.

vt_add - Starts the pre-defined VT Periodic with Addition test.

vt_can - Starts the pre-defined VT Periodic with Cancel test.

Example: vt_test vt_can

NOTE: Before starting these tests, the folowing must be set:

Vt Payload Enabled
VT Payload Source Internal
Payload Sync set to SONET Clock

COMMAND: vt_test?

ACTION: Returns the VT Pointer testng mode.

Response: OFF , VT , VT_BUR , VT_ADD or VT_CAN

Example: vt_test?
VT_TEST OFF

NOTE: The value OFF is returned after the test has completed.

A.4 TOH/POH COMMANDS

COMMAND: oh_all?

ACTION: Returns all 28 of the TOH/POH bytes. The response will contain the parameters in the following order:

A1, A2, ... E2, Z5

Response: <Non-decimal Numerics>

Example: oh_all?
OH_ALL Ø, #HF6;1,#H28; ...

COMMAND: oh_byte [s],[b1]

ACTION: Sets any of the TOH/POH bytes, by setting the overhead byte 's' to the value 'b1':

's' : ASCII string containing one of the mnemonics indicating an overhead byte (see below).

'b1': #H00 to #HFF, (Hex)
or #Q000 to #Q377, (Octal)
or #B0 to #B11111111 (Binary)

Example: oh_byte 'K2' , #h22

NOTE: See Section 7.0 for details on programming with non-decimal numbers.

The following is a list of the valid mnemonics for the overhead bytes:

A1	A2		J1
	E1	F1	
D1	D2	D3	C2
			G1
	K1	K2	F2
D4	D5	D6	
D7	D8	D9	Z3
D10	D11	D12	Z4
Z1	Z2	E2	Z5

COMMAND: oh_byte? [s]

ACTION: Returns the current value of the specified TOH/POH byte 's', specified as above.

Response: <String Response> ,
<Non-decimal Numeric>

Example: oh_byte? 'k2'
OH_BYTE 'K2' , #H22

COMMAND: oh_byte_off [n],[b1]

ACTION: Sets any of the TOH/POH bytes, by setting the overhead byte 'n' to the value 'b1':

'n' : number corresponding to a TOH/POH over head byte (see below).

'b1': #H00 to #HFF, (Hex)
or #Q000 to #Q377, (Octal)
or #B0 to #B11111111 (Binary)

Example: oh_byte_off 18 , #h22

NOTE: See Section 7.0 for details on programming with non-decimal numbers.

The following is a list correlating the overhead bytes to the numbers:

A1 : 00	A2 : 01		J1 : 03
	E1 : 05	F1 : 06	
D1 : 08	D2 : 09	D3 : 10	C2 : 11
			G1 : 15
	K1 : 17	K2 : 18	F2 : 19
D4 : 20	D5 : 21	D6 : 22	
D7 : 24	D8 : 25	D9 : 26	Z3 : 27
D10 : 28	D11 : 29	D12 : 30	Z4 : 31
Z1 : 32	Z2 : 33	E2 : 34	Z5 : 35

COMMAND: oh_byte_off? [n]

ACTION: Returns the current value of the specified TOH/POH byte 'n', specified as above.

Response: <NR1 Numeric> ,
<Non-decimal Numeric>

Example: oh_byte_off? 18
OH_BYTE_OFF 18 , #H22

COMMAND: oh_default

ACTION: Sets all of the TOH/POH bytes to the factory default (see Appendix B).

Example: oh_default

COMMAND: oh_edit [on,esc,enter]

ACTION: Controls the editing of the TOH/POH bytes. This way all of the OH Bytes change at once, when the edit is complete. Setting the OH bytes using the commands oh_byte and oh_byte_off can only be done when in the OH edit mode. Retrieving the values of the OH bytes can be done at anytime. If in OH edit mode, the values being edited will be returned. If not in OH edit mode, the currently transmitted values will be returned.

on - Edit enabled for the OH bytes.

esc - Edit disabled for the OH bytes and the edit changes are discarded.

enter - Edit disabled for the OH bytes and the edit changes are accepted.

Example: oh_edit enter

COMMAND: oh_edit?

ACTION: Returns the current OH edit mode.

Response: ON or OFF.

Example: oh_edit?
OH_EDIT OFF

A.5 ERROR COMMANDS

COMMAND: ais_burst [n]

ACTION: Sets the number of frames to Burst the AIS to 'n':

0 to 255 if ais_type not vtpath
0 to 63 if ais_type set to vtpath

Example: ais_burst 33

COMMAND: ais_burst?

ACTION: Returns the AIS burst frame count.

Response: <NR1 Numeric>

Example: ais_burst?
AIS_BURST 22

COMMAND: ais_mode [burst,cont]

ACTION: Sets the AIS error mode:

burst - Transmits AIS for a number of frames (see ais_burst).

cont - AIS continually transmitted until disabled.

Example: ais_mode cont

COMMAND: ais_mode?

ACTION: Returns the AIS error mode.

Response: BURST or CONT.

Example: ais_mode?
AIS_MODE BURST

COMMAND: ais_type [line,path,vtpath]

ACTION: Sets the type of AIS to be transmitted:

line - Line AIS test.

path - Path AIS test.

vtpath - VT Path AIS test.

Example: ais_type vtpath

COMMAND: ais_type?

ACTION: Returns the AIS type to be tested.

Response: LINE , PATH or VTPATH.

Example: ais_type?
AIS_TYPE VTPATH

COMMAND: aps_burst [n]

ACTION: Sets the number of frames to Burst the APS Test to 'n':

0 to 255

Example: aps_burst 21

COMMAND: aps_burst?

ACTION: Returns the APS Test burst count.

Response: <NR1 Numeric>

Example: aps_burst?
APS_BURST 3

COMMAND: aps_byte [b1],[b2]

ACTION: Sets the APS Test overhead bytes K1 to 'b1' and K2 to 'b2':

'b1':	#H00 to #HFF,	(Hex)
or	#Q000 to #Q377,	(Octal)
or	#B0 to #B11111111	(Binary)
'b2':	#H00 to #HFF,	(Hex)
or	#Q000 to #Q377,	(Octal)
or	#B0 to #B11111111	(Binary)

Example: aps_byte #hcc , #hee

NOTE: See Section 7.0 for details on programming with non-decimal numbers.

COMMAND: aps_byte?

ACTION: Returns the APS test K1/K2 bytes.

Response: <Non-decimal Numerics>

Example: aps_byte?
APS_BYTE #HCC , #HEE

COMMAND: aps_incons [on,off]

ACTION: Controls the APS Test inconsistency mode.

on - APS Byte output toggles between the default TOH/POH K1/K2 values and those set by aps_byte.

off - APS Byte output is always the bytes set by aps_byte.

Example: aps_incons off

COMMAND: aps_incons?

ACTION: Returns the APS Test inconsistency mode.

Response: ON or OFF.

Example: aps_incons?
APS_INCONS OFF

COMMAND: aps_mode [burst,cont,timed]

ACTION: Sets the APS Test output mode:

burst - APS output for a number of frames (see aps_burst).

cont - APS continually output until disabled.

timed - APS output for a number of seconds (see aps_time).

Example: aps_mode timed

COMMAND: aps_mode?

ACTION: Returns the APS Test output mode.

Response: BURST , CONT or TIMED.

Example: aps_mode?
APS_MODE CONT

COMMAND: aps_time [n]

ACTION: Sets the number of seconds to output the APS Test to 'n':

1 to 1200

Example: aps_time 21

COMMAND: aps_time?

ACTION: Returns the APS Test time.

Response: <NR1 Numeric>

Example: aps_time?
APS_TIME 21

COMMAND: b1_parity

ACTION: Generates a single B1 parity error at the selected STS rate (see sts_rate).

Example: b1_parity

COMMAND: b2_parity

ACTION: Generates a single B2 parity error on all STS-1 channels.

Example: b2_parity

COMMAND: b3_parity

ACTION: Generates a single B3 parity error on all STS-1 channels.

Example: b3_parity

COMMAND: bpv_rate [n]

ACTION: Sets the STSX-1/DSX-3 BPV error rate to 1E-'n', where 'n' is as follows:

3 to 9

Example: bpv_rate 6

COMMAND: bpv_rate?

ACTION: Returns the exponent of the STSX-1/DSX-3 error rate.

Response: <NR1 Numeric>

Example: bpv_rate?
BPV_RATE 6

COMMAND: ds1_error

ACTION: Generates a single DS1 Bit error.

Example: ds1_error

COMMAND: ds3_error

ACTION: Generates a single DS3 Bit/Parity error.

Example: ds3_error

COMMAND: error_enab
[off,ais,aps,ferf,lof,oh,yellow]

ACTION: Controls the Error output mode:

- off - None of the below error output is enabled.
- ais - The AIS error is output as specified by the AIS commands.
- aps - The APS error is output as specified by the APS commands.
- ferf - The Line FERF error is output as specified by the Line FERF commands.
- lof - The Frame Loss is output as specified by the Frame Loss commands.
- oh - The TOH/POH byte error values are output as specified by the TOH/POH error commands.
- yellow - The Yellow Alarm is output as specified by the Yellow Alarm commands.

Example: error_enab ferf

COMMAND: error_enab?

ACTION: Returns the current error output status.

Response: OFF, AIS, APS, FERF, LOF , OH or YELLOW.

Example: error_enab?
ERROR_ENAB FERF

NOTE: The value OFF is returned after the specified test has completed.

COMMAND: error_rate [off,bpv,sts]

ACTION: Controls the Error Rate generator.

- off - No error rate generated.
- bpv - BPV errors generated at the rate specified by the command bpv_rate.
- sts - STS Parity errors generated at the rate specified by the command parity_rate.

Example: error_rate off

COMMAND: error_rate?

ACTION: Returns the Error Rate generator status.

Response: OFF, BPV or STS.

Example: error_rate?
ERROR_RATE STS

COMMAND: ferf_burst [n]

ACTION: Sets the number of frames to Burst the Line FERF to 'n':

0 to 255

Example: ferf_burst 33

COMMAND: ferf_burst?

ACTION: Returns the Line FERF burst frame count.

Response: <NR1 Numeric>

Example: ferf_burst?
FERF_BURST 22

COMMAND: ferf_mode [burst,cont]

ACTION: Sets the Line FERF error mode:

- burst - Transmits Line FERF for a number of frames (see ferf_burst).
- cont - Line FERF continually transmitted until disabled.

Example: ferf_mode cont

COMMAND: ferf_mode?

ACTION: Returns the Line FERF error mode.

Response: BURST or CONT.

Example: ferf_mode?
FERF_MODE BURST

COMMAND: fr_los_burst [n]

ACTION: Sets the number of frames to Burst the Frame Loss to 'n':

0 to 255

Example: fr_los_burst 21

COMMAND: fr_los_burst?

ACTION: Returns the Frame Loss burst count.

Response: <NR1 Numeric>

Example: fr_los_burst?
FR_LOS_BURST 3

COMMAND: fr_los_byte [b1],[b2]

ACTION: Sets the Frame Loss test overhead bytes A1 to 'b1' and A2 to 'b2':

'b1':		#H00 to #HFF,	(Hex)
	or	#Q000 to #Q377,	(Octal)
	or	#B0 to #B11111111	(Binary)
'b2':		#H00 to #HFF,	(Hex)
	or	#Q000 to #Q377,	(Octal)
	or	#B0 to #B11111111	(Binary)

Example: fr_los_byte #hf6 , #h27

NOTE: See Section 7.0 for details on programming with non-decimal numbers.

COMMAND: fr_los_byte?

ACTION: Returns the Frame Loss test A1/A2 bytes.

Response: <Non-decimal Numerics>

Example: fr_los_byte?
FR_LOS_BYTE #HF6 , #H27

COMMAND: fr_los_mode [burst,cont]

ACTION: Sets the Frame Loss test output mode:

burst - Frame Loss burst for a number of frames (see fr_los_burst).

cont - Frame Loss continually output until disabled.

Example: fr_los_mode burst

COMMAND: fr_los_mode?

ACTION: Returns the Frame Loss test output mode.

Response: BURST or CONT.

Example: fr_los_mode?
FR_LOS_MODE CONT

COMMAND: los_enab

ACTION: Enables the Loss Of Signal condition.

COMMAND: los_time [n]

ACTION: Sets the length of time that the Loss Of Signal will occur, when enabled, to 'n':

0 to 0.000150 seconds, steps of 1 usec.

Example: los_time 123e-6

COMMAND: los_time?

ACTION: Returns the Loss Of Signal time.

Response: <NR3 Numeric>

Example: los_time?
LOS_TIME 123E-6

COMMAND: oh_copy

ACTION: Sets all of the TOH/POH byte error values to the current TOH/POH bytes.

Example: oh_copy

COMMAND: oh_err_all?

ACTION: Returns all 28 of the TOH/POH byte error values. The response will contain the parameters in the following order:

A1, A2, ... E2, Z5

Response: <Non-decimal Numerics>

Example: oh_err_all?
OH_ERR_ALL Ø, #HF6;1,#H28; ...

COMMAND: oh_err_burst [n]

ACTION: Sets the number frames the TOH/POH byte error values will be burst out in the OH Burst error mode to 'n':

0 to 255

Example: oh_err_burst 12

COMMAND: oh_err_burst?

ACTION: Returns the burst count for the TOH/POH byte error output in Burst error mode.

Response: <NR1 Numeric>.

Example: oh_err_burst?
OH_ERR_BURST 2

COMMAND: oh_err_byte [s],[b1]

ACTION: Sets any of the TOH/POH byte error values, by setting the overhead byte 's' to 'b1':

's' - ASCII string containing one of the mnemonics indicating an overhead byte (see below).

'b1': #H00 to #HFF, (Hex)
or #Q000 to #Q377, (Octal)
or #B0 to #B11111111 (Binary)

Example: oh_err_byte 'K2' , #h44

NOTE: See Section 7.0 for details on programming with non-decimal numbers.

The following is a list of the valid mnemonics for the overhead bytes:

A 1	A 2		J 1
	E 1	F 1	
D 1	D 2	D 3	C 2
			G 1
	K 1	K 2	F 2
D 4	D 5	D 6	
D 7	D 8	D 9	Z 3
D 10	D 11	D 12	Z 4
Z 1	Z 2	E 2	Z 5

COMMAND: oh_err_byte? [s]

ACTION: Returns the error value of the specified TOH/POH byte 's', specified as above.

Response: <Non-decimal Numeric>

Example: oh_err_byte? 'k2'
OH_ERR_BYTE 'K2' , #H44

COMMAND: oh_err_edit [on,esc,enter]

ACTION: Controls the editing of the TOH/POH byte error values. This way all of the OH Bytes change at once, when the edit is complete. Setting the OH bytes using the commands oh_err_byte and oh_err_off can only be done when in the OH error edit mode. Retrieving the values of the OH bytes can be done at anytime. If in OH error edit mode, the values being edited will be returned. If not in OH error edit mode, the current values will be returned.

on - OH error byte edit enabled.

esc - OH error byte edit disabled and the edit changes are discarded.

enter - OH error byte edit disabled and the edit changes are accepted.

Example: oh_err_edit enter

COMMAND: oh_err_edit?

ACTION: Returns the current OH error edit mode.

Response: ON or OFF.

Example: oh_err_edit?
OH_ERR_EDIT OFF

COMMAND: oh_err_mode [burst,cont]

ACTION: Sets the mode to output the TOH/POH byte error values:

burst - The error byte values are burst out for the number of frames specified in oh_err_burst.

cont - The error byte values are output until disabled by error_enab.

Example: oh_err_mode burst

COMMAND: oh_err_mode?

ACTIVE: Returns the current TOH/POH byte error output mode.

Response: BURST or CONT.

Example: oh_err_mode?
OH_ERR_MODE CONT

COMMAND: oh_err_off [n],[b1]

ACTIVE: Sets any of the TOH/POH byte error values, by setting the overhead byte 'n' to 'b1':

'n' - number corresponding to a TOH/POH overhead byte (see below).

'b1': #H00 to #HFF, (Hex)

or #Q000 to #Q377, (Octal)

or #B0 to #B11111111 (Binary)

Example: oh_err_off 18 , #h44

NOTE: See Section 7.0 for details on programming with non-decimal numbers.

The following is a list correlating the overhead bytes to the numbers:

A1 : 00	A2 : 01		J1 : 03
	E1 : 05	F1 : 06	
D1 : 08	D2 : 09	D3 : 10	C2 11
			G1 : 15
	K1 : 17	K2 : 18	F2 : 19
D4 : 20	D5 : 21	D6 : 22	
D7 : 24	D8 : 25	D9 : 26	Z3 : 27
D10 : 28	D11 : 29	D12 : 30	Z4 : 31
Z1 : 32	Z2 : 33	E2 : 34	Z5 : 35

COMMAND: oh_err_off? [n]

ACTIVE: Returns the error value of the specified TOH/POH byte 'n', specified as above.

Response: <Non-decimal Numeric>

Example: oh_err_off? 18
OH_ERR_OFF 18 , #H44

COMMAND: parity_rate [n]

ACTION: Sets the STS-N random parity error rate to 1E-'n', where 'n' is as follows:

3 to 9

Example: parity_rate 6

COMMAND: parity_rate?

ACTIVE: Returns the exponent of the STS-N Parity error rate.

Response: <NR1 Numeric>

Example: parity_rate?
PARITY_RATE 4

COMMAND: random_b1

ACTION: Generates a single random bit error on the overall STS-N output which makes the overall B1 parity incorrect.

Example: random_b1

COMMAND: spe_cons_ndf [n]

ACTION: Controls the SPE Pointer used in the Consecutive NDF Test. The SPE Pointer 'n' is continually output with a NDF:

0 to 783

Example: spe_cons_ndf 522

COMMAND: spe_cons_ndf?

ACTION: Returns the SPE Pointer used in the Consecutive NDF Test.

Response: <NR1 Numeric>

Example: spe_cons_ndf?
SPE_CONS_NDF 522

COMMAND: spe_d_bits [b1]

ACTION: Controls the SPE Decrement Bits for the Majority Vote Test. These are the 5 bits in the SPE Pointer which are used in the single decrement Pointer Justification. The byte 'b1' controls which of the bits are to be inverted during the single decrement. A majority of 1's causes a pointer movement, where a majority of 0's invert the bits as errors.

'b1': #H00 to #H1F, (Hex)

or #Q000 to #Q037, (Octal)

or #B0 to #B00011111 (Binary)

Example: spe_d_bits #b01010

COMMAND: spe_d_bits?

ACTION: Returns the SPE D Bit setting.

Response: <Non-decimal Numeric>

Example: spe_d_bits?
SPE_D_BITS #H0A

COMMAND: **spe_err_enab [off,range,ndf,dbit,ibit,cons]**

ACTION: Controls the SPE Pointer error Test mode:

off	-	Disables all of the SPE Pointer Error Tests.
range	-	Sends the Out of Range SPE Ptr.
ndf	-	Sends the SPE NDF values.
dbit	-	Sends the Decrement SPE Ptr.
ibit	-	Sends the Increment SPE Ptr.
cons	-	Continually sends NDF and the SPE Pointer until disabled.

Example: **spe_err_enab cons**

NOTE: The NDF, DBIT, and IBIT test modes output a single occurance, and then return to OFF mode. For RANGE and CONS, the output is continuous and must be turned off by this command.

WARNING: If the error output is NEVER turned off, the operation of the unit might not be as expected.

COMMAND: **spe_err_enab?**

ACTION: Returns the SPE Pointer error Test mode.

Response: OFF , RANGE or CONS

Example: **spe_err_enab?**
SPE_ERR_ENAB IBIT

COMMAND: **spe_err_ndf [b1]**

ACTION: Sets the SPE NDF to 'b1' during the SPE NDF Test (4-bit right-justified):

'b1':	#H00 to #H0F,	(Hex)
or	#Q000 to #Q017,	(Octal)
or	#B0 to #B00001111	(Binary)

Example: **spe_err_ndf #b1010**

NOTE: See Section 7.0 for details on programming with non-decimal numbers.

COMMAND: **spe_err_ndf?**

ACTION: Returns the SPE NDF Test NDF value

Response: <Non-decimal Numeric>

Example: **spe_err_ndf?**
SPE_ERR_NDF #H0A

COMMAND: **spe_err_ptr [n]**

ACTION: Sets the SPE Pointer to 'n' during the SPE NDF Test:

0 to 782

Example: **spe_err_ptr 522**

COMMAND: **spe_err_ptr?**

ACTION: Returns the SPE NDF Test Pointer value.

Response: <NR1 Numeric>

Example: **spe_err_ptr?**
SPE_ERR_PTR 522

COMMAND: **spe_err_rng [n]**

ACTION: Sets the SPE pointer to 'n', an out of range SPE pointer:

783 to 1023

Example: **spe_err_rng 921**

COMMAND: **spe_err_rng?**

ACTION: Returns the out of range SPE pointer setting.

Response: <NR1 Numeric>

Example: **spe_err_rng?**
SPE_ERR_RNG 921

COMMAND: **spe_i_bits [b1]**

ACTION: Controls the SPE Increment Bits for the Majority Vote Test. These are the 5 bits in the SPE Pointer which are used in the single increment Pointer Justification. The byte 'b1' controls which of the bits are to be inverted during the single increment. A majority of 1's causes a pointer movement, where a majority of 0's invert the bits as errors.

'b1':	#H00 to #H1F,	(Hex)
or	#Q000 to #Q037,	(Octal)
or	#B0 to #B00011111	(Binary)

Example: **Spe_i_bits #b10001**

COMMAND: **spe_i_bits?**

ACTION: Returns the SPE I Bit setting.

Response: <Non-decimal Numeric>

Example: **spe_i_bits?**
SPE_I_BITS #H11

COMMAND: sts_channel [n]

ACTION: Generates a single random bit error into the selected STS-1 channel 'n':

1 to 12 (STS-12), (Can only be used if STS-12 option is installed).

1 to 3 (STS-3)

Example: sts_channel 2

COMMAND: vt_cons_ndf [n]

ACTION: Controls the VT Pointer used in the Consecutive NDF Test. The VT Pointer 'n' is continually output with a NDF:

0 to 103

Example: vt_cons_ndf 5

COMMAND: vt_cons_ndf?

ACTION: Returns the VT Pointer used in the Consecutive NDF Test.

Response: <NR1 Numeric>

Example: vt_cons_ndf?
VT_CONS_NDF 5

COMMAND: vt_d_bits [b1]

ACTION: Controls the VT Decrement Bits for the Majority Vote Test. These are the 5 bits in the VT Pointer which are used in the single decrement Pointer Justification. The byte 'b1' controls which of the bits are to be inverted during the single decrement. A majority of 1's causes a pointer movement, where a majority of 0's invert the bits as errors.

'b1':	#H00 to #H1F,	(Hex)
or	#Q000 to #Q037,	(Octal)
or	#B0 to #B00011111	(Binary)

Example: vt_d_bits #b01010

COMMAND: vt_d_bits?

ACTION: Returns the VT D Bit setting.

Response: <Non-decimal Numeric>

Example: vt_d_bits?
VT_D_BITS #H0A

COMMAND: vt_err_enab [off,range,ndf,dbit,ibit,cons]

ACTION: Controls the VT Pointer error Test mode:

off	-	Disables all of the VT Pointer Error Tests.
ange	-	Sends the Out of Range VT Ptr.
ndf	-	Sends the VT NDF values.
dbit	-	Sends the Decrement VT Ptr.
ibit	-	Sends the Increment VT Ptr.
cons	-	Continually sends NDF and the VT Pointer until disabled.

Example: vt_err_enab cons

NOTE: The NDF, DBIT, and IBIT test modes output a single occurance, and then return to OFF mode. For RANGE and CONS, the output is continuous and must be turned off by this command.

WARNING: If the error output is NEVER turned off, the operation of the unit might not be as expected.

COMMAND: vt_err_enab?

ACTION: Returns the VT Pointer error Test mode.

Response: OFF, RANGE or CONS

Example: vt_err_enab?
VT_ERR_ENAB RANGE

COMMAND: vt_err_ndf [b1]

ACTION: Sets the VT NDF to 'b1' during the VT NDF Test (4-bit right-justified):

'b1':	#H00 to #H0F,	(Hex)
or	#Q000 to #Q017,	(Octal)
or	#B0 to #B00001111	(Binary)

Example: vt_err_ndf #b1010

NOTE: See Section 7.0 for details on programming with non-decimal numbers.

COMMAND: vt_err_ndf?

ACTION: Returns the VT NDF Test NDF value.

Response: <Non-decimal Numeric>

Example: vt_err_ndf?
VT_ERR_NDF #H0A

COMMAND: vt_err_ptr [n]

ACTION: Sets the VT Pointer to 'n' during the VT NDF Test:

0 to 103

Example: vt_err_ptr 5

COMMAND: vt_err_ptr?

ACTION: Returns the VT NDF Test Pointer value.

Response: <NR1 Numeric>

Example: vt_err_ptr?
VT_ERR_PTR 5

COMMAND: vt_err_rng [n]

ACTION: Sets the VT pointer to 'n', an out of range VT pointer:

104 to 1023

Example: vt_err_rng 200

COMMAND: vt_err_rng?

ACTION: Returns the out of range VT pointer setting.

Response: <NR1 Numeric>

Example: vt_err_rng?
VT_ERR_RNG 200

COMMAND: vt_i_bits [b1]

ACTION: Controls the VT Increment Bits for the Majority Vote Test. These are the 5 bits in the VT Pointer which are used in the single increment Pointer Justification. The byte 'b1' controls which of the bits are to be inverted during the single increment. A majority of 1's causes a pointer movement, where a majority of 0's invert the bits as errors.

'b1': #H00 to #H1F, (Hex)
or #Q000 to #Q037, (Octal)
or #B0 to #B00011111 (Binary)

Example: vt_i_bits #b10001

COMMAND: vt_i_bits?

ACTION: Returns the VT I Bit setting.

Response: <Non-decimal Numeric>

Example: vt_i_bits?
VT_I_BITS #H11

COMMAND: yellow_burst [n]

ACTION: Sets the number of frames to Burst the Yellow alarm to 'n':

0 to 255

Example: yellow_burst 33

COMMAND: yellow_burst?

ACTION: Returns the Yellow alarm burst count.

Response: <NR1 Numeric>

Example: yellow_burst?
YELLOW_BURST 22

COMMAND: yellow_mode [burst,cont]

ACTION: Sets the Yellow alarm error mode:

burst - Transmits Yellow alarm for a number of frames (see yellow_burst).

cont - Yellow alarm continually transmitted until disabled.

Example: yellow_mode cont

COMMAND: yellow_mode?

ACTION: Returns the Yellow Alarm error mode.

Response: BURST or CONT.

Example: yellow_mode?
YELLOW_MODE BURST

COMMAND: yellow_type [vtpath,stspath]

ACTION: Sets the type of Yellow alarm to be transmitted:

vtpath - VT Path Yellow alarm test.
stspath - STS Path Yellow alarm test.

Example: yellow_type vtpath

COMMAND: yellow_type?

ACTION: Returns the Yellow alarm to be tested.

Response: VTPATH or STSPATH.

Example: yellow_type?
YELLOW_TYPE STSPATH

A.6 MISCELLANEOUS COMMANDS

COMMAND: header [on,off]

ACTION: Sets the remote command response header status:

on - Responses include command header (command name).

off - Disables header in response.

Example: header on

COMMAND: header?

ACTION: Returns the remote command response header status.

Response: ON or OFF.

Example: header?
HEADER ON
header off
header?
OFF

COMMAND: logo?

ACTION: Returns the ST-103 Logo (RS-232 only).

Example: logo?
MICROWAVE LOGIC ST-103 TX V1.0

COMMAND: rs_echo [on,off]

ACTION: Sets the RS-232 Echo mode status:

on - All RS-232 input echoed.

off - Disables echo mode.

Example: rs_echo on

COMMAND: rs_echo?

ACTION: Returns the RS-232 echo mode status.

Response: ON or OFF.

Example: rs_echo?
RS_ECHO OFF

COMMAND: rs_pmt_lf [on,off]

ACTION: Sets the RS-232 Prompt Line-Feed (0AH) Control status:

on - Line-Feed (0AH) sent after RS-232 prompt.

off - Line-Feed (0AH) not sent.

Example: rs_pmt_lf on

COMMAND: rs_pmt_lf?

ACTION: Returns the RS-232 Prompt Line-Feed (0AH) Control status.

Response: ON or OFF.

Example: rs_pmt_lf?
RS_PMT_LF OFF

COMMAND: rs_prompt [s]

ACTION: Sets the RS-232 prompt to the string 's'. Maximum length is 8 characters.

Example: rs_prompt 'ST103>'

COMMAND: rs_xon_xoff [on,off]

ACTION: Sets the RS-232 XON/XOFF protocol status:

on - Enables the XON/XOFF protocol.

off - Disables the XON/XOFF protocol.

Example: rs_xon_xoff on

COMMAND: rs_xon_xoff?

ACTION: Returns the RS-232 XON/XOFF status.

Response: ON or OFF.

Example: rs_xon_xoff?
RS_XON_XOFF OFF

A.7 IEEE-488 COMMON COMMANDS

COMMAND: *cls

ACTION: Clear Status, clears the Standard Event Status Register.

Example: *cls

COMMAND: *ese [n]

ACTION: Sets the Standard Event Status Enable Register to 'n':

0 to 255

Example: *ese 255

COMMAND: *ese?

ACTION: Returns the current contents of the Standard Event Status Enable Register.

Response: <NR1 Numeric>

Example: *ese?
255

COMMAND: *esr?

ACTION: Returns the current contents of the Standard Event Status Register.

Response: <NR1 Numeric>
Example: *esr?
0

COMMAND: *idn?

ACTION: Returns the ST-103 identification as follows:

Response: Manufacturer, Model 0, Firmware Level
Example: *idn?
MICROWAVE LOGIC, ST-103Tx , 0 , V1.0

COMMAND: *lrn?

ACTION: Returns the current device setup, as a series of message units that can be later sent back to the ST-103 to restore the unit to the same setup.

Response: sequence of response messages previously defined
Example: *lrn?
VIEW_ANGLE 3 ; ...

COMMAND: *opc

ACTION: Operation Complete Command, sets the operation complete message in the Standard Event Status Register immediately, because all device operations are completed immediately.

COMMAND: *opc?

ACTION: Returns the value '1' immediately.

Response: <NR1 Numeric>
Example: *opc?
1

COMMAND: *rst

ACTION: Performs a device reset, resetting the ST-103 to the factory supplied setup, see Appendix B.

COMMAND: *sre [n]

ACTION: Sets the Service Request Enable Register to 'n':

0 to 255
Example: *sre 255

COMMAND: *sre?

ACTION: Returns the current contents of the Service Request Enable Register, where bit 6 is ignored.

Response: <NR1 Numeric>
Example: *sre?
191

COMMAND: *stb?

ACTION: Returns the current contents of the Status Byte, where bit 6 is the Master Summary Status bit.

Response: <NR1 Numeric>
Example: *stb?
96

COMMAND: *tst?

ACTION: Returns the result of the self-test. Successful completion of the test will return a value of '0'. The scope of the test is limited.

Response: <NR1 Numeric>
Example: *tst?
0

COMMAND: *wai

ACTION: Wait To Continue, forces the ST-103 to stop processing remote commands, until all operations are completed, which is immediately.

Example: *wai

NOTE: All IEEE-488 Common command queries do NOT return the command header in their response.

NOTE: See Section 7.0, "GPIB Status Reporting", for information concerning the usage of the Standard Event Status Enable Register, the Standard Event Status Register, the Service Request Enable Register, and the Status Byte.

ST-103 TX FACTORY DEFAULT SETTINGS

The following is a list of Factory default settings for the ST-103 Tx. These are the values for the various operating parameters that will be used under the following conditions:

When the unit leaves the factory,

When the non-volatile RAM is corrupted,

When the remote command '*rst' is sent,

When one of the Quick Setups are recalled, and when the TOH/POH bytes are set to Default.

These settings can be changed by the user, and stored in non-volatile RAM. Should the non-volatile RAM be corrupted (due to battery failure) the unit will reset all settings as listed here and the message 'RAM CORRUPTION' will appear on the display for a few seconds to note that all settings are reset.

RETURNING to FACTORY DEFAULT SETTINGS

Resetting the unit to Factory default can be done in two ways: by recalling the proper Quick setup, or by sending the remote '*rst' command via the GPIB or RS-232C interface.

NOTE:
Use caution when returning to Factory default settings as any programmed parameters will be over written with the quick setup patterns listed here.

The following pages contain the setup information for the Quick Setups. The only parameters listed are the ones that are changed when the setup is recalled.

QUICK SETUP #0

'STSX-1, DS3 PAYLOAD'

MODE

Synchronization	
DS1	DSX-1
Payload	ASYNC
STS	ASYNC
DSX-1 Line code	AMI
Optical Output	OFF
Output Level	0 dBr
Programmable Sync Byte	A1
Signal	STS1
STS-1 Scrambler	ON

SPE/DSX

Payload enabled	DS3
DS3 Payload	
Alarms	OFF
Framing	M13
Pattern	PRBS
Payload source	INT
Word	0xAA

POINTER

SPE Test enabled	OFF
SPE Pointer	522
VT Test enabled	OFF

TOH/POH

Overhead bytes all set to 0, except A1 = F6 , A2 = 28 , C2 = 01.

ERROR

Error enabled	OFF
Error Rate enabled	OFF
SPE Pointer Testing	
Error output	OFF
VT Pointer Testing	
Error output	OFF

QUICK SETUP #1

'STSX-1, VT1.5 PAYLOAD'

MODE

Synchronization	
DS1	DSX-1
Payload	ASYNC
STS	ASYNC
DSX-1 Line code	AMI
Optical Output	OFF
Output Level	0 dBr
Programmable Sync Byte	A1
Signal	STS1
STS-1 Scrambler	ON

SPE/DSX

Payload enabled	VT
VT Payload	
Channel	1
Framing	UNFRAMED
Mapping	FLOATING
Pattern	QRW
Payload	INT
V5	2
Word	0x888000

POINTER

SPE Test enabled	OFF
SPE Pointer	522
VT Test enabled	OFF
VT Pointer	78

TOH/POH

Overhead bytes all set to 0, except A1 = F6 , A2 = 28 , C2 = 01.

ERROR

Error enabled	OFF
Error Rate enabled	OFF
SPE Pointer Testing	
Error output	OFF
VT Pointer Testing	
Error output	OFF

QUICK SETUP #2

'OC3, DS3 PAYLOAD'

MODE

Synchronization	
DS1	DSX-1
Payload	ASYNC
STS	ASYNC
DSX-1 Line code	AMI
Optical Output	ON
Output Level	0 dBr
Programmable Sync Byte	A1
Signal	STS3
STS-1 Scrambler	ON

SPE/DSX

Payload enabled	DS3
DS3 Payload	
Alarms	OFF
Framing	M13
Pattern	PRBS
Payload source	INT
Word	0xAA

POINTER

SPE Test enabled	OFF
SPE Pointer	522
VT Test enabled	OFF

TOH/POH

Overhead bytes all set to 0, except A1 = F6 , A2 = 28 , C2 = 01.

ERROR

Error enabled	OFF
Error Rate enabled	OFF
SPE Pointer Testing	
Error output	OFF
VT Pointer Testing	
Error output	OFF

QUICK SETUP #3

'OC3, VT1.5 PAYLOAD'

MODE

Synchronization	
DS1	DSX-1
Payload	ASYNC
STS	ASYNC
DSX-1 Line code	AMI
Optical Output	ON
Output Level	0 dBr
Programmable Sync Byte	A1
Signal	STS3
STS-1 Scrambler	ON

SPE/DSX

Payload enabled	VT
VT Payload	
Channel	1
Framing	UNFRAMED
Mapping	FLOATING
Pattern	QRW
Payload	INT
V5	2
Word	0x888000

POINTER

SPE Test enabled	OFF
SPE Pointer	522
VT Test enabled	OFF
VT Pointer	78

TOH/POH

Overhead bytes all set to 0, except A1 = F6 , A2 = 28 , C2 = 01.

ERROR

Error enabled	OFF
Error Rate enabled	OFF
SPE Pointer Testing	
Error output	OFF
VT Pointer Testing	
Error output	OFF

QUICK SETUP #4

'DSX-3 OUTPUT MODE'

MODE

Synchronization	
Payload	ASYNC
DSX-1 Line code	AMI
Optical Output	OFF
Output Level	0 dBr
Programmable Sync Byte	A1
Signal	DSX-3
STS-1 Scrambler	ON

SPE/DSX

Payload enabled	DS3
DS3 Payload	
Alarms	OFF
Framing	M13
Pattern	PRBS
Payload source	INT
Word	0xAA

POINTER

SPE Test enabled	OFF
SPE Pointer	522
VT Test enabled	OFF

ERROR

Error enabled	OFF
Error Rate enabled	OFF
SPE Pointer Testing	
Error output	OFF
VT Pointer Testing	
Error output	OFF

QUICK SETUP #5

'DSX-1 OUTPUT MODE'

MODE

Synchronization	
Payload	ASYNC
DSX-1 Line code	AMI
Optical Output	OFF
Output Level	0 dBr
Programmable Sync Byte	A1
Signal	STS1
STS-1 Scrambler	ON

SPE/DSX

Payload enabled	VT
VT Payload	
Channel	1
Framing	UNFRAMED
Mapping	FLOATING
Pattern	QRW
Payload	INT
V5	2
Word	0x888000

POINTER

SPE Test enabled	OFF
SPE Pointer	522
VT Test enabled	OFF
VT Pointer	78

ERROR

Error enabled	OFF
Error Rate enabled	OFF
SPE Pointer Testing	
Error output	OFF
VT Pointer Testing	
Error output	OFF

QUICK SETUP #6

'OC12, DS3 PAYLOAD'

MODE

Synchronization	
DS1	DSX-1
Payload	ASYNC
STS	ASYNC
DSX-1 Line code	AMI
Optical Output	ON
Output Level	0 dBr
Programmable Sync Byte	A1
Signal	STS12
STS-1 Scrambler	ON

SPE/DSX

Payload enabled	DS3
DS3 Payload	
Alarms	OFF
Framing	M13
Pattern	PRBS
Payload source	INT
Word	0xAA

POINTER

SPE Test enabled	OFF
SPE Pointer	522
VT Test enabled	OFF

TOH/POH

Overhead bytes all set to 0, except A1 = F6 , A2 = 28 , C2 = 01.

ERROR

Error enabled	OFF
Error Rate enabled	OFF
SPE Pointer Testing	
Error output	OFF
VT Pointer Testing	
Error output	OFF

QUICK SETUP #7

'OC12, VT1.5 PAYLOAD'

MODE

Synchronization	
DS1	DSX-1
Payload	ASYNC
STS	ASYNC
DSX-1 Line code	AMI
Optical Output	ON
Output Level	0 dBr
Programmable Sync Byte	A1
Signal	STS12

SPE/DSX

Payload enabled	VT
VT Payload	
Channel	1
Framing	UNFRAMED
Mapping	FLOATING
Pattern	QRW
Payload	INT
V5	2
Word	0x888000

POINTER

SPE Test enabled	OFF
SPE Pointer	522
VT Test enabled	OFF
VT Pointer	78

TOH/POH

Overhead bytes all set to 0, except A1 = F6 , A2 = 28 , C2 = 01.

ERROR

Error enabled	OFF
Error Rate enabled	OFF
SPE Pointer Testing	
Error output	OFF
VT Pointer Testing	
Error output	OFF

*QUICK SETUP #8 (FACTORY DEFAULT / *RST)*

'MASTER DEFAULT'

MODE

Synchronization	
DS1	DSX-1
Payload	ASYNC
STS	ASYNC
DSX-1 Line code	AMI
Optical Output	OFF
Output Level	0 dBr
Programmable Sync Byte	A1
Signal	STS1
View Angle	7

SPE/DSX

Payload enabled	DS3
DS3 Payload	
Alarms	OFF
Framing	M13
Pattern	PRBS
Payload source	INT
Word	0xAA
VT Payload	
Channel	1
Framing	UNFRAMED
Mapping	FLOATING
Pattern	QRW
Payload	INT
V5	2
Word	0x888000

POINTER

SPE Test enabled	OFF
SPE User Defined Pointer Test	
SPE Pointer	522
Burst count	10
Frame interval	1000
Mode	BURST
NDF Pointer	522
Polarity	POS
SPE Burst Pointer Test	
Initialization time	60 seconds
Measurement Period	30 seconds
Polarity	POS
Number of tests	10
SPE Periodic with Addition Test	
Initialization time	60 seconds
Measurement Period	30 seconds
Interval time	1 second
Polarity	POS
Number of tests	10
SPE Periodic with Cancel Test	
Initialization time	60 seconds
Measurement Period	30 seconds
Interval time	1 second
Polarity	POS
Number of tests	10
VT Test enabled	OFF
VT User Defined Pointer Test	
Burst count	10
Frame interval	1000
Mode	BURST
NDF Pointer	78
Polarity	POS
VT Burst Pointer Test	
Initialization time	60 seconds
Measurement Period	30 seconds
Polarity	POS
Number of tests	10
VT Periodic with Addition Test	
Initialization time	60 seconds
Measurement Period	30 seconds
Interval time	1 second
Polarity	POS
Number of tests	10

POINTER (Cont)

VT Periodic with Cancel Test	
Initialization time	60 seconds
Measurement Period	30 seconds
Interval time	1 second
Polarity	POS
Number of tests	10

TOH/POH

Overhead bytes all set to 0, except A1 = F6, A2 = 28, C2 = 01.

ERROR

Error enabled	OFF
Error Rate enabled	OFF
AIS Testing	
Burst count	5
Mode	BURST
Type	LINE
APS Testing	
Burst count	3
Bytes	00 00
Inconsistency	OFF
Mode	BURST
Time	3 seconds
BPV Error Rate	1.0E-3
FERF Testing	
Burst count	5
Mode	BURST
Frame Loss Testing	
Burst count	28
Mode	BURST
Bytes	E6 28
LOS Time	100 uS
OH Error Bytes	Same as default TOH/POH
STS Parity Error Rate	1.0E-3
SPE Pointer Testing	
Error output	OFF
Out of Range SPE Pointer	783
NDF Flag	1001
NDF SPE Pointer	522
D Bits	11111
I Bits	11111
Consecutive NDF Flag	522

ERROR (CONT)

VT Pointer Testing	
Error output	OFF
Out of Range VT Pointer	104
NDF Flag	1001
NDF VT Pointer	78
D Bits	11111
I Bits	11111
Consecutive NDF Flag	78
Yellow Alarm Testing	
Burst count	10
Mode	BURST
Type	STSPATH

MISCELLANEOUS

Remote mode	LOCAL
RS-232C	
Prompt	ST-103>
BAUD rate	9600
Parity	EVEN
Character size	8 bits
EOL	CR / LF
XON/XOFF	OFF
Echo	ON
Prompt Line-Feed	OFF
GPIB	
Address	9
GPIB bus control status	TALK/LISTEN
GPIB terminator	EOI/LF
Remote command response header	ON

DEFAULT TOH/POH

A1 : F6	A2 : 28	C1 : —	J1 : 00
B1 : —	E1 : 00	F1 : 00	B3 : —
D1 : 00	D2 : 00	D3 : 00	C2 : 01
H1 —	H2 : —	H3 : —	G1 : 00
B2 : —	K1 : 00	K2 : 00	F2 : 00
D4 : 00	D5 : 00	D6 : 00	H4 : —
D7 : 00	D8 : 00	D9 : 00	Z3 : 00
D10 : 00	D11 : 00	D12 : 00	Z4 : 00
Z1 : 00	Z2 : 00	E2 : 00	Z5 : 00

SPE_I_bits <Non-Decimal Numeric>

SPE_Mode [BURST,CONT]

SPE_Ndf

SPE_POInter?

SPE_POLar [NEG,POS,EXT]

SPE_PTr_ndf <NRx>

SPE_Single [NEG,POS]

SPE_Test [OFF, SPE, SPE_BUR, SPE_ADD, SPE_CAN]

STOred?

STS1_scram [ON,OFF]

STS_Channel <NRx>

STS_Sync [STS1,STS3,STS12,DS,ASYNC]

VIew_angle <NRx>

VT_ADD_Int <NRx>

VT_ADD_PEr <NRx>

VT_ADD_POl [NEG,POS]

VT_ADD_TEst <NRx>

VT_ADD_TIme <NRx>

VT_BUR_PEr <NRx>

VT_BUR_POl [NEG,POS]

VT_BUR_TEst <NRx>

VT_BUR_TIme <NRx>

VT_BURSt <NRx>

VT_CAN_Int <NRx>

VT_CAN_PEr <NRx>

VT_CAN_POl [NEG,POS]

VT_CAN_TEst <NRx>

VT_CAN_TIme <NRx>

VT_CHannel <NRx>

VT_COns_ndf <NRx>

VT_D_bits <Non-Decimal Numeric>

VT_ERR_Enab [OFF, RANGE, NDF, DBIT, IBIT, CONS]

VT_ERR_Ndf <Non-Decimal Numeric>

VT_ERR_Ptr <NRx>

VT_ERR_Rng <NRx>

VT_FRAMEs <NRx>

VT_FRAMIng [UNFRAMED,D4]

VT_I_bits <Non-Decimal Numeric>

VT_MApping [LOCKED,FLOATING]

VT_MOde [BURST,CONT]

VT_Ndf

VT_PAttern [WORD, PRBS_9, PRBS_15, PRBS_20, PRBS_23, QRW]

VT_POInter?

VT_POLar [NEG,POS]

VT_PTr_ndf <NRx>

VT_PYld [INT,EXT]

VT_Single [NEG,POS]

VT_Test [OFF, VT ,VT_BUR, VT_ADD, VT_CAN]

VT_V5 <NRx>

VT_Word <Non-Decimal Numeric>, <Non-Decimal Numeric>, <Non-Decimal Numeric>

YELLOW_Burst <NRx>

YELLOW_Mode [BURST, CONT]

YELLOW_Type [VTPATH, STSPATH]

MODE Commands

C1_Parity [OFF,ODD,EVEN]

DS1_Sync [DSX1,DS1CLK]
DSX1_code [AMI,B8ZS]

EDit_setup <NRx>,<qstring>
EDit_setup? <NRx>

GPIB_Address <NRx>
GPIB_Bus [TALK_LISTEN,OFF_BUS]

OPT_Output [ON,OFF]
OPTIons?
OUtput_level <NRx>

PSYNC_Byte <qstring>
PSYNC_Offset <NRx>
PYLD_Sync [ASYNC,DS1,STS]

Quick_setup <NRx>

REcall_setup <NRx>

SAve_setup <NRx>
SIgnal [STS1, STS3, STS12, DSX3]
STOred?
STS_Sync [STS1, STS3, STS12, DS, ASYNC]
STS1_scram [ON, OFF]

VIew_angle <NRx>

SPE/DSX Command

DS3_Alarms [OFF, XBIT, AIS, IDLE]
DS3_Framing [M13, CBIT, UNFRAMED]
DS3_PAttern [PRBS, WORD]
DS3_PYId [INT, EXT]
DS3_Word <Non-Decimal Numeric>

PYLD_Enab [VT, DS3]

VT_CHannel <NRx>
VT_FRAMIng [UNFRAMED, D4]
VT_MApping [LOCKED, FLOATING]
VT_PAttern [WORD, PRBS_9, PRBS_15, PRBS_20, PRBS_23, QRW]
VT_PYId [INT, EXT]
VT_V5 <NRx>
VT_Word <Non-Decimal Numeric>, <Non-Decimal Numeric>, <Non-Decimal Numeric>

POINTER Commands

SPE_ADD_Int <NRx>
SPE_ADD_PEr <NRx>
SPE_ADD_POI [NEG, POS, EXT]
SPE_ADD_TEst <NRx>
SPE_ADD_TIme <NRx>
SPE_BUR_PEr <NRx>
SPE_BUR_POI [NEG, POS, EXT]
SPE_BUR_TEst <NRx>
SPE_BUR_TIme <NRx>
SPE_BURSt <NRx>
SPE_CAN_Int <NRx>
SPE_CAN_PEr <NRx>
SPE_CAN_POI [NEG, POS, EXT]
SPE_CAN_TEst <NRx>
SPE_CAN_TIme <NRx>
SPE_Frames <NRx>
SPE_Mode [BURST, CONT]
SPE_Ndf
SPE_POInter?
SPE_POLar [NEG, POS, EXT]

POINTER Commands (Cont)

SPE_PTr_ndf <NRx>

SPE_Single [NEG, POS]

SPE_Test [OFF, SPE, SPE_BUR, SPE_ADD, SPE_CAN]

VT_ADD_Int <NRx>

VT_ADD_PEr <NRx>

VT_ADD_POl [NEG, POS]

VT_ADD_TEst <NRx>

VT_ADD_TIme <NRx>

VT_BUR_PEr <NRx>

VT_BUR_POl [NEG, POS]

VT_BUR_TEst <NRx>

VT_BUR_TIme <NRx>

VT_BURSt <NRx>

VT_CAN_Int <NRx>

VT_CAN_PEr <NRx>

VT_CAN_POl [NEG, POS]

VT_CAN_TEst <NRx>

VT_CAN_TIme <NRx>

VT_FRAMEs <NRx>

VT_MOde [BURST, CONT]

VT_Ndf

VT_POInter?

VT_POLar [NEG, POS]

VT_PTr_ndf <NRx>

VT_Single [NEG, POS]

VT_Test [OFF, VT, VT_BUR, VT_ADD, VT_CAN]

TOH/POH Commands

OH_All?

OH_BYTE <qstring>,<Non-Decimal Numeric>

OH_BYTE? <qstring>

OH_BYTE_Off <NRx>,<Non-Decimal Numeric>

OH_BYTE_Off? <NRx>

OH_Default

OH_EDit [ON, ESC, ENTER]

ERROR Commands

AIS_Burst <NRx>

AIS_Mode [BURST, CONT]

AIS_Type [LINE, PATH, VTPATH]

APS_BUrst <NRx>

APS_BYte <Non-Decimal Numeric> <Non-Decimal Numeric>

APS_Incons [ON, OFF]

APS_Mode [BURST, CONT, TIMED]

APS_Time <NRx>

B1_parity

B2_parity

B3_parity

BPv_rate <NRx>

C1_Error

DS1_Error

DS3_Error

ERROR_Enab [OFF, AIS, APS, FERF, LOF, OH, YELLOW]

ERROR_Rate [OFF,BPV,STS]

FERF_Burst <NRx>

FERF_Mode [BURST, CONT]

FR_LOS_BUrst <NRx>

FR_LOS_BYte<Non-Decimal Numeric>, <Non-Decimal Numeric>

FR_LOS_Mode [BURST, CONT]

ERROR Commands (Cont)

LOS_Enab

LOS_Time <NRx>

OH_Copy

OH_ERR_All?

OH_ERR_BUrst <NRx>

OH_ERR_BYte <qstring>, <Non-Decimal Numeric>

OH_ERR_BYte? <qstring>

OH_ERR_Edit [ON, ESC, ENTER]

OH_ERR_Mode [BURST, CONT]

OH_ERR_Off <NRx>, <Non-Decimal Numeric>

OH_ERR_Off? <NRx>

PArity_rate <NRx>

RAndom_b1

SPE_COns_ndf <NRx>

SPE_D_bits <Non-Decimal Numeric>

SPE_ERR_Enab [OFF, RANGE, NDF, DBIT, IBIT, CONS]

SPE_ERR_Ndf <Non-Decimal Numeric>

SPE_ERR_Ptr <NRx>

SPE_ERR_Rng <NRx>

SPE_I_bits <Non-Decimal Numeric>

STS_Channel <NRx>

VT_COns_ndf <NRx>

VT_D_bits <Non-Decimal Numeric>

VT_ERR_Enab [OFF, RANGE, NDF, DBIT, IBIT, CONS]

VT_ERR_Ndf <Non-Decimal Numeric>

VT_ERR_Ptr <NRx>

VT_ERR_Rng <NRx>

VT_I_bits <Non-Decimal Numeric>

YELLOW_Burst <NRx>

YELLOW_Mode [BURST, CONT]

YELLOW_Type [VTPATH, STSPATH]

MISCELLANEOUS Commands

Header [ON, OFF]

LOGo?

RS_Echo [ON, OFF]

RS_PMt_lf [ON, OFF]

RS_PRompt <qstring>

RS_Xon_xoff [ON, OFF]

IEEE-488 Common Commands

*CLS

*ESE <NRx>

*ESR?

*IDN?

*LRN?

*OPC

*RST

*SRE <NRx>

*STB?

*TST?

*WAI

The following charts describe the indexing into the frame data:

ALL:

0	[A1]	1	[A2]	2	[C1]	3...	89
90	[B1]	91	[E1]	92	[F1]	93...	179
180	[D1]	181	[D2]	182	[D3]	183...	269
270	[H1]	271	[H2]	272	[H3]	273...	359
360	[B2]	361	[K1]	362	[K2]	363...	449
450	[D4]	451	[D5]	452	[D6]	453...	539
540	[D7]	541	[D8]	542	[D9]	543...	629
630	[D10]	631	[D11]	632	[D12]	633...	719
720	[Z1]	721	[Z2]	722	[E2]	723...	809

SPE:

0	[J1]	1	2	...	86
87	[B3]	88	89	...	173
174	[C2]	175	176	...	260
261	[G1]	262	263	...	347
348	[F2]	349	350	...	434
435	[H4]	436	437	...	521
522	[Z3]	523	524	...	608
609	[Z4]	610	611	...	695
696	[Z5]	697	698	...	782

TOH:

0	[A1]	1	[A2]	2	[C1]
3	[B1]	4	[E1]	5	[F1]
6	[D1]	7	[D2]	8	[D3]
9	[H1]	10	[H2]	11	[H3]
12	[B2]	13	[K1]	14	[K2]
15	[D4]	16	[D5]	17	[D6]
18	[D7]	19	[D8]	20	[D9]
21	[D10]	22	[D11]	23	[D12]
24	[Z1]	25	[Z2]	26	[E2]

POH:

0	[J1]
1	[B3]
2	[C2]
3	[G1]
4	[F2]
5	[H4]
6	[Z3]
7	[Z4]
8	[Z5]

For example to retrieve the frame data starting at the H1 byte with the frame capture by ALL, the command would be:

frame_data? 270

Example: frame_data? 0
FRAME_DATA
0,10, #HF6, #H28, #H01,#HAA, #HAA, #HAA, #HAA, #HAA, #HAA, #HAA

> **WARNING:** FRAME_DATA query is invalid when the trigger is armed and not yet triggered.

COMMAND: frame_number [n]

ACTION: Sets the number of the Frame that will be examined to 'n':

-3639 to 255

The valid range for the frame number can be retrieved through the command frame_range.

Example: frame_number 12

COMMAND: frame_number?

ACTION: Returns the current Frame number being examined.

Response: <NR1 Numeric>

Example: frame_number?
FRAME_NUMBER -19

COMMAND: frame_range?

ACTION: Returns the numbers corresponding to the available frame numbers that can be examined following a Frame Capture.

Response: <NR1 Numeric>

Example: frame_range?
FRAME_RANGE -19, 20

COMMAND: gpib_address [v]

ACTION: Sets the GPIB Address to 'v':
0 to 30
(allowed by RS-232 interface only)
Example: gpib_address 14

COMMAND: gpib_address?

ACTION: Returns the current GPIB Address.
Response: <NR1 Numeric>
(allowed by RS-232 interface only)
Example: gpib_address?
GPIB_ADDRESS 15

COMMAND: gpib_bus [talk_listen,off_bus]

ACTION: Sets the ST-103 GPIB Bus control. When set to OFF-BUS, it will not communicate over the GPIB bus.
talk_listen - Communicates over BUS.
off_bus - No GPIB Communication
(allowed by RS-232 interface only)
Example: gpib_bus talk_listen

COMMAND: gpib_bus?

ACTION: Returns the GPIB Bus control status.
Response: TALK_LISTEN or OFF_BUS
(allowed by RS-232 interface only)
Example: gpib_bus?
GPIB_BUS OFF_BUS

COMMAND: options?

ACTION: Returns the options included with the ST-103.
Response: STS12 or NONE
Example: options?
OPTIONS STS12

COMMAND: quick_setup [n]

ACTION: This command recalls a quick setup from one of the pre-defined setups. There are a total of 9 pre-defined setups.

See Appendix E for the details on the pre-defined setups. The setup at location 'n' is recalled:
0 to 8
where 'n' corresponds the the quick setups as follows:

0 - 'STSX-1, DS3 PAYLOAD'
1 - 'STSX-1, VT1.5 PAYLOAD'
2 - 'OC3, DS3 PAYLOAD'
3 - 'OC3, VT1.5 PAYLOAD'
4 - 'DSX-3 INPUT MODE'
5 - 'DSX-1 INPUT MODE'
6 - 'OC12, DS3 PAYLOAD'
7 - 'OC12, VT1.5 PAYLOAD'
8 - 'MASTER DEFAULT'

Example: quick_setup 3

COMMAND: recall_setup [n]

ACTION: This command recalls a setup from one of setup locations. There are 10 user setup storage locations. The setup at location 'n' is recalled:
0 to 9
Example: recall_setup 8

NOTE: Only those seup locations with stored setups can be recalled (see stored?).

COMMAND: save_setup [n]

ACTION: This command takes the current setup of ST-103 and stores it into a setup storage location. There are 10 user setup storage locations. The setup is stored at 'n':
0 to 9
Example: save_setup 3

RECEIVER REMOTE COMMANDS

This is the command set for the ST-103 Rx (Receiver). All remote commands are listed here. A brief description of each command, valid parameters, and response format are included. The parameters shown within brackets '[ ]' following the command name are required. The commands are separated into eight functional groups, listed in the following order.

GROUP	FUNCTION
1 Mode Commands	Mode and setup control
2 SPE/DSX Commands	SPE/DSX Mapping and payload
3 Pointer Commands	Pointer status
4 TOH/POH Commands	Transport/Path OverHead
5 Measure Commands	Measurement command
6 LED Status Commands	Front Panel LED status
7 Miscellaneous	Miscellaneous commands
8 Common Commands	Common Commands defined by IEEE-488.2

The commands listed on the following pages show the command name and the valid parameters. The examples which are shown with the commands demonstrate the command format. In the examples and in the response lists, the upper case denotes what is returned from the ST-103, where lower case denotes what is sent to the ST-103.

In all of the examples, the full command name is sent to the ST-103. Sending the full command name to the ST-103 is not necessary. For any command, all that is needed is enough to make it unique. All parameters, which are specified within brackets '[ ]', must be entered exactly as shown in the brackets.

For remote commands which are specified as Test Results, the 'test_prev' command will control the source of the retrieved data. This command controls whether the data will come from the currently running test or the test previously run ('test_prev current' or 'test_prev previous'). After a test stops, it remains the current test. Once another test is started, the prior test becomes the previous, and the new one becomes the currently running test. These Test Result commands will be found under the Pointer, Measure and LED Status commands.

For Test Results which return Status values (CLEAR/HIST/CUR), the reading of the current status is a destructive read. The condition has to occur again after the read for it to be CUR again. Also, after the condition occurs, it will appear as CUR until read again by remote command.

NOTE: The Status values that are returned can be affected by a History Reset (histry_reset). When a status is from the current test (test_prev current),the value is the status from the last history reset. The start of a test does a history reset. For a previous test status, the value is for the entire test.

D.1 MODE COMMANDS

COMMAND: audio_vol [n]

ACTION: Sets the Audio Volume of the internal speaker, Audible Error Indicator, to 'n':
0 to 9
Example: audio_vol 0

COMMAND: audio_vol?

ACTION: Returns the setting of the Audio Volume.
Response: <NR1 Numeric>
Example: audio_vol?
AUDIO_VOL 2

COMMAND: clock [nrz,rec]

ACTION: Sets the input clock mode:
nrz - Input clock is received from the rear panel NRZ ECL input.
rec - Clock is recovered from data signal.
Example: clock rec

COMMAND: clock?

ACTION: Returns the input clock mode.
Response: NRZ or REC
Example: clock?
CLOCK NRZ

COMMAND: data [nrz_ecl,nrz_diff,bipol,optic]

ACTION: Sets the input signal data type:
- nrz_ecl- Input data is NRZ at the ECL levels, from the rear panel.
- nrz_diff- Input data is Differential NRZ, from the rear panel.
- bipol - Input data is Bipolar, from the front panel.
- optic - Input data is Optical, from the front panel. Thiscan only be selected if the Optical option is installed.

Example: data optic

COMMAND: data?

ACTION: Returns the input signal data type.
Response: NRZ_ECL, NRZ_DIFF, BIPOL or OPTIC

Example: data?
DATA NRZ_ECL

COMMAND: date [s]

ACTION: Sets the Internal Time of Day Clock to the date specified by 's', where the date is of the format 'YYYY/MM/DD':
- YYYY - years, Ex: 1991
- MM - month, 1 to 12
- DD - day, 1 to 31

Example: date '1991/12/25'

COMMAND: date?

ACTION: Returns the current Date from the Time of Day clock.
Response: <String response> in format 'YYYY/MM/DD'

Example: date?
DATE '1991/12/25'

COMMAND: dsx_level [terminate,bridge]

ACTION: Sets the DSX-1 and DSX-3 level for Bipolar inputs:
- terminate - DSX normal terminate level.
- bridge - DSX monitor level.

Example: dsx_level bridge

COMMAND: dsx_level?

ACTION: Returns the DSX Bipolar input level.
Response: TERMINATE or BRIDGE.

Example: dsx_level?
DSX_LEVEL TERMINATE

COMMAND: edit_setup [n],[s]

ACTION: This command allows changes to the text descriptions of any of the 10 user setup locations. The setup at location 'n' will have the description 's':
- 'n' : 0 to 9
- 's' : an ASCII string with a maximum length of 25 characters

Example: edit_setup 3 , 'STS-12 TEST'

COMMAND: edit_setup? [n]

ACTION: Returns the text description of the 'n' user setup locations.
Response: <String Response>

Example: edit_setup? 3
EDIT_SETUP 3 , 'OC12 TEST 123'

COMMAND: frame_data? [n]

ACTION: Returns the Frame Capture data from the frame specified by frame_number. The data returned is the frame bytes starting at 'n' for up to 10 bytes:
- 'n' : 0 to 809 (for ALL)
- 0 to 782 (for SPE)
- 0 to 26 (for TOH)
- 0 to 8 (for POH)

The number of byte returned will be:
- 10 (for ALL/SPE/TOH)
- 9 (for POH)

unless the data requested goes past the end of the frame, in which case the bytes returned will be only those from the single frame.

COMMAND: signal [sts1,sts3,sts12,dsx1,dsx3]

ACTION: Sets the input signal rate which is to be monitored:

sts1 - STS-1 monitored.
sts3 - STS-3 monitored.
sts12 - STS-12 monitored.
dsx1 - DSX-1 monitored.
dsx3 - DSX-3 monitored.

Example: signal sts12

COMMAND: signal?

ACTION: Returns the input signal rate monitored.
Response: STS1 , STS3 , STS12 , DSX1 or DSX3

Example: signal?
SIGNAL DSX1

COMMAND: stored?

ACTION: Returns all of the user setup locations which contain stored setups.
Response: <NR1 Numeric(s)>

Example: stored?
STORED 0,5,8

COMMAND: sts_descr [on,off]

ACTION: Controls the STS-1 and STS-3 Descrambler.
on - STS input descrambled.
off - STS input not descrambled.

Example: sts_descr on

NOTE: This does not control the STS-12 input, which does not presently support optional descrambling.

COMMAND: sts_descr?

ACTION: Returns the STS-1/STS-3 Decrambler value.
Response: ON or OFF.

Example: sts_descr?
STS_DESCR OFF

COMMAND: time [s]

ACTION: Sets the Internal Time of Day Clock to the time specified by 's', where the time is of the format 'HH:MM:SS':

HH - hours, 0 to 23
MM - minutes, 0 to 59
SS - seconds, 0 to 59

Example: time '12:00:00'

COMMAND: time?

ACTION: Returns the current Time.
Response: <String response>
in format 'HH:MM:SS'

Example: time?
TIME '12:00:00'

COMMAND: trig_arm [on,off]

ACTION: Controls the arming of the Frame Capture Trigger:

on - Trigger is Armed. On the next occurance of the trigger, the frame capture storage will take place and the trigger will be disarmed.
off - Trigger is not Armed.

Example: trig_arm off

NOTE: The storage of the Frame data will occur while the trigger is ARMed and for up to the following 255 frames. Once the trigger is ARMed, all of the previous Frame Capture data is lost.

COMMAND: trig_arm?

ACTION: Returns the Trigger Arming status.
Response: ON or OFF.

Example: trig_arm?
TRIG_ARM ON

COMMAND: trig_byte [s]

ACTION: Sets the Trigger Address to 's', where 's' is an ASCII string containing a mnemonic indicating an overhead byte.

The following is a list of the valid mnemonics for the overhead bytes:

A 1	A 2	C 1	J 1
B 1	E 1	F 1	B 3
D 1	D 2	D 3	C 2
H 1	H 2	H 3	G 1
B 2	K 1	K 2	F 2
D 4	D 5	D 6	H 4
D 7	D 8	D 9	Z 3
D 10	D 11	D 12	Z 4
Z 1	Z 2	E 2	Z 5

Example command: trig_byte 'J1'

COMMAND: trig_byte?

ACTION: Returns the Trigger Address mnemonic.
Response: String containing one of the above mnemonics.
Example: trig_byte?
TRIG_BYTE 'D12'

NOTE: 'SPE' will be returned if the Trigger Address has been programmed by offset and is not an overhead byte.

COMMAND: trig_frames [n]

ACTION: Sets the number of SONET frames to be stored after the Frame Capture trigger to 'n':
0 to 255
Example: trig_frames 10

NOTE: It is possible to specify the number of frames, such that all of the stored frame data is after the trigger. For example, if the storage capacity is 40 frames and there are to be 90 Frames after Trigger, the storage would contain the 51st to 90th frames after the trigger occured.

COMMAND: trig_frames?

ACTION: Returns the number of storage frames.
Response: <NR1 Numeric>
Example: trig_frames?
TRIG_FRAMES 20

COMMAND: trig_offset [n]

ACTION: Sets the Trigger Address to 'n' bytes following the J1 byte in the SPE.
0 to 782
Example: trig_offset 654

COMMAND: trig_offset?

ACTION: Returns the Trigger Address offset.
Response: <NR1 Numeric>
Example: trig_offset?
TRIG_OFFSET 12

NOTE: -1 will be returned if the Trigger Address has been set by mnemonic and is not in the SPE.

COMMAND: trig_src [int,ext]

ACTION: Sets the Frame Capture Trigger source:
int - Triggered internally according to the programmed Trigger Word and Trigger Address.
ext - Triggered by the external rear panel connector (TTL Level, Trigger on Low).
Example: trig_src int

COMMAND: trig_src?

ACTION: Returns the Trigger source.
Response: INT or EXT.
Example: trig_src?
TRIG_SRC EXT

COMMAND: trig_store [all,toh,spe,poh]

ACTION: Sets the type of storage for the Frame Capture:

- all - All of the SONET Frame will be stored (up to 40 frames).
- toh - Only the Transport OverHead bytes will be stored (up to 1213 frames).
- spe - All of the Sync. Payload Envelope will be stored (up to 41 frames).
- poh - Only the Path OverHead bytes will be stored (up to 3640 frames).

Example: trig_store spe

COMMAND: trig_store?

ACTION: Returns the Frame Capture storage type.
Response: ALL ,TOH ,SPE or POH.
Example: trig_store?
TRIG_STORE POH

COMMAND: trig_word [b1],[b2]

ACTION: Sets the Frame Capture Internal Trigger Word to 'b1', using 'b2' as a DON'T CARE mask. Each bit set in 'b2' is a don't care bit (equivalent to an 'x' on the front panel).
'b1','b2': #H00 to #HFF, (Hex)
or #Q000 to #Q377, (Octal)
or #B0 to #B11111111 (Binary)
Example: trig_word #hf6,#H00

NOTE: See Section 11 for details on programming with non-decimal numbers.

COMMAND: trig_word?

ACTION: Returns the Internal Trigger Word.
Response: <Non-Decimal Numerics>
Example: trig_word?
TRIG_WORD #HF6,#H00

COMMAND: view_angle [n]

ACTION: Sets the front panel display view angle to 'n': 0 to 15
Example: view_angle 12

COMMAND: view_angle?

ACTION: Returns the current display view angle.
Response: <NR1 Numeric>
Example: view_angle?
VIEW_ANGLE 3

COMMAND: vt_scan? [n]

ACTION: Performs a VT1.5 channel scan on the selected VT1.5 channel 'n' and returns the status of the selected VT1.5 channel. This will be either: the channel number that the signal was transmitted as by the ST-103 Tx, a status code (the Active channel of the ST-103 Tx will be this also), or a message that indicating AIS received.
'n' : 1 to 28
The message returned will be as follows:

Channel number:
'CH1' to 'CH28'

or A framing status:
'U/' - Unframed
'D/' - D4 Framing
'E/' - ESF Framing

and a data pattern status:
'FX' - Fixed word
'9' - 2E9 PRBS
'15' - 2E15 PRBS
'20' - 2E20 PRBS
'23' - 2E23 PRBS
'QW' - QRW PRBS
'?' - Unknown data pattern

or a message:
'AIS'

The following are some possible values.

Response: 'CH14', 'U/23', 'E/QW', 'D/FX', 'AIS'
Example: vt_scan? 23
VT_SCAN 'CH12'

D.2 SPE/DSX COMMANDS

COMMAND: ds3_auto [on,off]

ACTION: Sets the DS3 Auto Pattern Search mode:
- on - Automatic search on the DS3 input signal for the correct data pattern and framing.
- off - The DS3 input signal is monitored as per the settings of ds3_pattern and ds3_framing.

Example: ds3_auto off

COMMAND: ds3_auto?

ACTION: Returns the DS3 Auto Search mode.
Response: ON or OFF
Example: ds3_auto?
DS3_AUTO ON

COMMAND: ds3_framing [m13,cbit,unframed]

ACTION: Sets the DS3 framing mode:
- m13 - DS3 in M13 framing mode.
- cbit - DS3 in C-BIT framing mode.
- unframed - DS3 in unframed mode.

Example: ds3_framing cbit

COMMAND: ds3_framing?

ACTION: Returns the DS3 framing mode.
Response: M13 , CBIT or UNFRAMED.
Example: ds3_framing?
DS3_FRAMING UNFRAMED

COMMAND: ds3_pattern [prbs,word]

ACTION: Sets the monitored data pattern for the DS3 payload as follows:
- word - Any 8-bit repeating pattern.
- prbs - 2E15 INV PRBS data pattern.

Example: ds3_pattern prbs

COMMAND: ds3_pattern?

ACTION: Returns the DS3 data pattern.
Response: PRBS or WORD.
Example: ds3_pattern?
DS3_PATTERN WORD

COMMAND: pyld_enab [vt,ds3]

ACTION: Sets the payload type to be expected in the STS-1 payload being received:
- vt - VT1.5 payload enabled.
- ds3 - DS3 payload enabled.

Example: pyld_enab vt

COMMAND: pyld_enab?

ACTION: Returns the payload type in the STS-1.
Response: VT or DS3.
Example: pyld_enab?
PYLD_ENAB DS3

COMMAND: vt_auto [on,off]

ACTION: Sets the VT1.5/DSX-1 Auto Search mode:
- on - Automatic search on the selected DS1 signal for the correct data pattern and framing.
- off - The selected DS1 signal is monitored as per the settings of vt_pattern and vt_framing.

Example: vt_auto on

NOTE: The Auto pattern search will not include searching for 2E20 PRBS.

COMMAND: vt_auto?

ACTION: Returns the VT1.5/DSX-1 Auto Search mode.
Response: ON or OFF
Example: vt_auto?
VT_AUTO OFF

COMMAND: vt_channel [n]

ACTION: Sets the VT1.5 channel to measure to 'n':
1 to 28
Example: vt_channel 23

COMMAND: vt_channel?

ACTION: Returns the measured VT1.5 channel.
Response: <NR1 Numeric>
Example: vt_channel?
VT_CHANNEL 5

COMMAND: vt_framing [unframed,d4,esf]

ACTION: Sets the VT1.5/DSX-1 framing mode:
- unframed - DS1 is unframed.
- d4 - DS1 is framed as D4.
- esf - DS1 is framed as ESF.

Example: vt_framing d4

COMMAND: vt_framing?

ACTION: Returns the VT1.5/DSX-1 framing mode:
Response: UNFRAMED , D4 or ESF.

Example: vt_framing?
VT_FRAMING UNFRAMED

COMMAND: vt_mapping [locked,floating]

ACTION: Sets the VT mode for mapping into the VT1.5 payload:
- locked - Locked VT Mode.
- floating - Floating VT Mode.

Example: vt_mapping floating

COMMAND: vt_mapping?

ACTION: Returns the VT mode for mapping into the VT1.5 payload:
Response: LOCKED or FLOATING

Example: vt_mapping?
VT_MAPPING LOCKED

COMMAND: vt_pattern
[word,prbs_9;prbs_15,prbs_20,prbs_23,qrw]

ACTION: Sets the monitored data pattern for the VT1.5/DSX-1 as follows:
- word - Any 24-bit repeating pattern.
- prbs_9 - 2E9 PRBS data pattern.
- prbs_15 - 2E15 PRBS data pattern.
- prbs_20 - 2E20 PRBS data pattern.
- prbs_23 - 2E23 PRBS data pattern.
- qrw - Quasi-random data pattern, 2E20 with a maximum of 14 0's.

Example: vt_pattern prbs_9

COMMAND: vt_pattern?

ACTION: Returns the VT1.5/DSX-1 data pattern.
Response: WORD , PRBS_9 , PRBS_15 , PRBS_20 , PRBS_23 or QRW.

Example: vt_pattern?
VT_PATTERN QRW

D.3 POINTER COMMANDS

COMMAND: spe_ndf?

ACTION: Returns the Test Result for the number of SPE New Data Flags received.
Response: <NR1 Numeric>

Example: spe_ndf?
SPE_NDF 1234

COMMAND: spe_neg_pj?

ACTION: Returns the Test Result for the number of Negative SPE Pointer Adjustments.
Response: <NR1 Numeric>

Example: spe_neg_pj?
SPE_NEG_PJ 43

COMMAND: spe_pointer?

ACTION: Returns the current SPE Pointer.
Response: <NR1 Numeric>

Example: spe_pointer?
SPE_POINTER 522

COMMAND: spe_pos_pj?

ACTION: Returns the Test Result for the number of Positive SPE Pointer Adjustments.
Response: <NR1 Numeric>

Example: spe_pos_pj?
SPE_POS_PJ 23

COMMAND: spe_rng?

ACTION: Returns the Test Result for the status of Out Of Range SPE Pointers.
Response: CLEAR , CUR or HIST

Example: spe_rng?
SPE_RNG HIST

NOTE: CUR is only available for the currently running test.

COMMAND: vt_lop?

ACTION: Returns the Test Result for the status of VT Loss Of Pointer.
Response: CLEAR , CUR or HIST
Example: vt_lop?
VT_LOP CLEAR

NOTE: CUR is only available for the currently running test.

COMMAND: vt_ndf?

ACTION: Returns the Test Result for the number of VT New Data Flags received.
Response: <NR1 Numeric>
Example: vt_ndf?
VT_NDF 4321

COMMAND: vt_neg_pj?

ACTION: Returns the Test Result for the number of Negative VT Pointer Adjustments.
Response: <NR1 Numeric>
Example: vt_neg_pj?
VT_NEG_PJ 12

COMMAND: vt_pointer?

ACTION: Returns the current VT Pointer.
Response: <NR1 Numeric>
Example: vt_pointer?
VT_POINTER 5

COMMAND: vt_pos_pj?

ACTION: Returns the Test Result for the number of Positive VT Pointer Adjustments.
Response: <NR1 Numeric>
Example: vt_pos_pj?
VT_POS_PJ 65

COMMAND: vt_rng?

ACTION: Returns the Test Result for the status of Out Of Range VT Pointers.
Response: CLEAR , CUR or HIST
Example: vt_rng?
VT_RNG CLEAR

NOTE: CUR is only available for the currently running test.

D.4 TOH/POH COMMANDS

COMMAND: oh_all?

ACTION: Returns all 40 of the OverHead bytes. The parameters will be in the following order:
A1, A2, C1, ... V3, V4
Response: <Non-decimal Numerics>
Example: oh_all?
OH_ALL 0,#HF6;1,#H28; ...

NOTE: For the above command, the value returned for overhead bytes that are not valid ('V1', 'V2', 'V3', and 'V4' bytes when VT1.5 is not enabled, or all of the above when the SIGNAL is DSX1 or DSX3) will be undefined.

COMMAND: oh_byte? [s]

ACTION: Returns the current value of the specified TOH/POH (VT OH) byte 's':
's' - ASCII string containing one of the mnemonics indicating an overhead byte (see below).
Response: <String Response>,
<Non-decimal Numeric>
Example: oh_byte? 'k2'
OH_BYTE 'K2' , #H22

The following is a list of the valid mnemonics for the overhead bytes:

A 1	A 2	C 1	J 1
B 1	E 1	F 1	B 3
D 1	D 2	D 3	C 2
H 1	H 2	H 3	G 1
B 2	K 1	K 2	F 2
D 4	D 5	D 6	H 4
D 7	D 8	D 9	Z 3
D 10	D 11	D 12	Z 4
Z 1	Z 2	E 2	Z 5
V 1	V 2	V 3	V 4

COMMAND: oh_byte_off? [n]

ACTION: Returns the current value of the specified TOH/POH (VT OH) byte 'n':
'n' - number corresponding to an overhead byte (see below).
Response: <NR1 Numeric>, <Non-decimal Numeric>
Example: oh_byte_off? 00
OH_BYTE_OFF 00 , #HF6

The following is a list correlating the overhead bytes to the numbers:

A1 :00	A2 : 01	C1 : 02	J1 : 03
B1 :04	E1 : 05	F1 : 06	B3 : 07
D1 :08	D2 : 09	D3 :10	C2 : 11
H1 :12	H2 : 13	H3 : 14	G1 : 15
B2 :16	K1 : 17	K2 : 18	F2 : 19
D4 :20	D5 : 21	D6 : 22	H4 : 23
D7 :24	D8 : 25	D9 : 26	Z3 : 27
D10 :28	D11 : 29	D12 : 30	Z4 : 31
Z1 :32	Z2 : 33	E2 : 34	Z5 : 35
V1 :36	V2 : 37	V3 : 38	V4 : 39

D.5 MEASURE COMMANDS

COMMAND: aps_byte?

ACTION: Returns the current K1/K2 APS Byte.
Response: <Non-decimal Numerics>
Example: aps_byte?
APS_BYTE #HFF , #H55

COMMAND: aps_count?

ACTION: Returns the Test Result for the count of APS Switches.
Response: <NR1 Numeric>
Example: aps_count?
APS_COUNT 5

COMMAND: aps_dur?

ACTION: Returns the Test Result for the duration of APS in seconds.
Response: <NR1 Numeric>
Example: aps_dur?
APS_DUR 100

COMMAND: aps_inc?

ACTION: Returns the Test Result for the status of APS inconsistency.
Response: CLEAR , CUR or HIST
Example: aps_inc?
APS_INC CLEAR

NOTE: CUR is only available for the currently running test.

COMMAND: aps_inv?

ACTION: Returns the Test Result for the status of APS invalid code.
Response: CLEAR , CUR or HIST
Example: aps_inv?
APS_INV CLEAR

NOTE: CUR is only available for the currently running test.

COMMAND: b1_ber?

ACTION: Returns the Test Result for the B1 Code Violation Bit Error Rate.
Response: <NR3 Numeric>
Example: b1_ber?
B1_BER 1.7E-05

COMMAND: b1_err?

ACTION: Returns the Test Result for the number of B1 Code Violations.
Response: <NR1 Numeric>
Example: b1_err?
B1_ERR 43234

COMMAND: b1_es?

ACTION: Returns the Test Result for the number of B1 Errored Seconds, seconds that contained B1 code violations or Out Of Frame conditions during the Test.
Response: <NR1 Numeric>
Example: b1_es?
B1_ES 42

COMMAND: b1_per_efs?

ACTION: Returns the Test Result for the number corresponding to the B1 Percent Error Free Seconds.
Response: <NR1 Numeric>
Example: b1_per_efs?
B1_PER_EFS 100

COMMAND: b1_sefs?

ACTION: Returns the Test Result for the number of B1 Severely Errored Framing Seconds, seconds with one or more OOFs during the Test.
Response: <NR1 Numeric>
Example: b1_sefs?
B1_SEFS 22

COMMAND: b1_ses?

ACTION: Returns the Test Result for the number of B1 Severely Errored Seconds, seconds with K or more B1 code violations or an Out Of Frame condition during the Test, where K is:
OC-1 : K = 9
OC-3 : K = 16
OC-12 : K = 63
Response: <NR1 Numeric>
Example: b1_ses?
B1_SES 22

COMMAND: b2_ber?

ACTION: Returns the Test Result for the B2 Code Violation Bit Error Rate.
Response: <NR3 Numeric>
Example: b2_ber?
B2_BER 0.0E-09

COMMAND: b2_err?

ACTIOIN: Returns the Test Result for the number of B2 Code Violations.
Response: <NR1 Numeric>
Example: b2_err?
B2_ERR 0

COMMAND: b2_es?

ACTION: Returns the Test Result for the number of B2 Errored Seconds, seconds that contained B2 code violations during the Test.
Response: <NR1 Numeric>
Example: b2_es?
B2_ES 0

COMMAND: b2_per_efs?

ACTION: Returns the Test Result for the number corresponding to the B2 Percent Error Free Seconds.
Response: <NR1 Numeric>
Example: b2_per_efs?
B2_PER_EFS 100

COMMAND: b2_ses?

ACTION: Returns the Test Result for the number of B2 Severely Errored Seconds, seconds with K or more B2 code violations during the Test, where K is:
OC-1 : K = 12
OC-3 : K = 32
OC-12 : K = 124
Response: <NR1 Numeric>
Example: b2_ses?
B2_SES 0

COMMAND: b3_ber?

ACTION: Returns the Test Result for the B3 Code Violation Bit Error Rate.
Response: <NR3 Numeric>
Example: b3_ber?
B3_BER 0.0E-09

COMMAND: b3_err?

ACTION: Returns the Test Result for the number of B3 Code Violations.
Response: <NR1 Numeric>
Example: b3_err?
B3_ERR 0

COMMAND: b3_es?

ACTION: Returns the Test Result for the number of B3 Errored Seconds, seconds that contained B3 code violations during the Test.
Response: <NR1 Numeric>
Example: b3_es?
B3_ES 0

COMMAND: b3_per_efs?

ACTION: Returns the Test Result for the number corresponding to the B3 Percent Error Free Seconds.
Response: <NR1 Numeric>
Example: b3_per_efs?
B3_PER_EFS 100

COMMAND: b3_ses?

ACTION: Returns the Test Result for the number of B3 Severely Errored Seconds, seconds with K or more B3 code violations during the Test, where K is:
STS - 1 : K =9
STS - 3c : K =16
Response: <NR1 Numeric>
Example: b3_ses?
B3_SES 0

COMMAND: bpv_err?

ACTION: Returns the Test Result for the number of STSX/DSX BPV errors.
Response: <NR1 Numeric>
Example: bpv_err?
BPV_ERR 1234

COMMAND: bpv_rate?

ACTION: Returns the Test Result for the STSX/DSX BPV Error Rate.
Response: <NR3 Numeric>
Example: bpv_rate?
BPV_RATE 1.2E-06

COMMAND: ds_ais?

ACTION: Returns the Test Result for the status of Payload/DSX AIS.
Response: CLEAR , CUR or HIST
Example: ds_ais?
DS_AIS HIST

NOTE: CUR is only available for the currently running test.

COMMAND: ds_bit_err?

ACTION: Returns the Test Result for the number of Payload/DSX Bit errors.
Response: <NR1 Numeric>
Example: ds_bit_err?
DS_BIT_ERR 35

COMMAND: ds_bit_rate?

ACTION: Returns the Test Result for the Payload/ DSX Bit Error Rate.
Response: <NR3 Numeric>
Example: ds_bit_rate?
DS_BIT_RATE 3.5E-09

COMMAND: ds_fram_err?

ACTION: Returns the Test Result for the number of Payload/DSX Frame errors.
Response: <NR1 Numeric>
Example: ds_fram_err?
DS_FRAM_ERR 17000

COMMAND: ds_lof?

ACTION: Returns the Test Result for the status of Payload/DSX Loss of Frame.
Response: CLEAR , CUR or HIST
Example: ds_lof?
DS_LOF HIST

NOTE: CUR is only available for the currently running test.

COMMAND: ds_lop?

ACTION: Returns the Test Result for the status of Payload/DSX Loss of Pattern.
Response: CLEAR , CUR or HIST
Example: ds_lop?
DS_LOP HIST

NOTE: CUR is only available for the currently running test.

COMMAND: ds1_crc6_err?

ACTION: Returns the Test Result for the number of Payload/DS1 CRC-6 errors.
Response: <NR1 Numeric>
Example: ds1_crc6_err?
DS1_CRC6_ERR 17

COMMAND: ds1_crc6_rat?

ACTION: Returns the Test Result for the Payload/ DS1 CRC-6 Error Rate.
Response: <NR3 Numeric>
Example: ds1_crc6_rat?
DS1_CRC6_RAT 1.7E-08

COMMAND: ds1_yellow?

ACTION: Returns the Test Result for the status of Payload/DS1 Yellow alarm.
Response: CLEAR , CUR or HIST
Example: ds1_yellow?
DS1_YELLOW CLEAR

NOTE: CUR is only available for the currently running test.

COMMAND: ds3_idle?

ACTION: Returns the Test Result for the status of Payload/DS3 IDLE.
Response: CLEAR , CUR or HIST
Example: ds3_idle?
DS3_IDLE CUR

NOTE: CUR is only available for the currently running test.

COMMAND: ds3_par_err?

ACTION: Returns the Test Result for the number of Payload/DS3 Parity errors.
Response: <NR1 Numeric>
Example: ds3_par_err?
DS3_PAR_ERR 5000

COMMAND: ds3_par_rate?

ACTION: Returns the Test Result for the Payload/ DS3 Parity Error Rate.
Response: <NR3 Numeric>
Example: ds3_par_rate?
DS3_PAR_RATE 9.9E-06

COMMAND: ds3_xbit?

ACTION: Returns the Test Result for the status of Payload/DS3 XBIT.
Response: CLEAR , CUR or HIST
Example: ds3_xbit?
DS3_XBIT HIST

NOTE: CUR is only available for the currently running test.

COMMAND: elap_time?

ACTION: Returns the elapsed time for the test, in seconds.
Response: <NR1 Numeric>
Example: elap_time?
elap_time 120

COMMAND: log_clear

ACTION: Clears the Error Log from the units Non-Volatile memory. This is useful when the log_print command is going to be used, so that the print is limited to certain time frame.
Example: log_clear

COMMAND: log_print

ACTION: Prints the Error Log stored in the units Non-Volatile memory. This will be all of the errors logged since the last clear of the Error Log.

COMMAND: print_mode [eot,log,off,both]

ACTION: the Test print mode:
- eot - Test reports will automatically be printed at the End of test.
- log - During a test, error logs will be printed as they occur.
- off - No test reports will automatically be printed.
- both - Both EOT and Error Log printouts will be done.

Example: print_mode eot

COMMAND: print_mode?

ACTION: Returns the current Test print mode.
Response: EOT , LOG , OFF or BOTH
Example: print_mode?
PRINT_MODE OFF

COMMAND: start_time?

ACTION: Returns the Start Time of the Test.
Response: <String response> in format 'YYYY/MM/DD HH:MM:SS'
Example: start_time?
START_TIME '1992/01/31 12:00:00'

COMMAND: stop_time?

ACTION: Returns the Stop Time of the Test.
Response: <String response> in format 'YYYY/MM/DD HH:MM:SS'
Example: stop_time?
STOP_TIME '1992/01/31 12:01:00'

NOTE: This is only valid for tests which have ended.

COMMAND: sts_channel [n]

ACTION: Sets the STS-3 or STS-12 Channel, which will be monitored, to 'n':
- 1 to 1 (STS-1)
- 1 to 3 (STS-3)
- 1 to12 (STS-12) (can only be selected if STS-12 option is installed)

Example: sts_channel 7

COMMAND: sts_channel?

ACTION: Returns the selected STS Channel.
Response: <NR1 Numeric>
Example: sts_channel?
STS_CHANNEL 4

COMMAND: sts_febe_err?

ACTION: Returns the Test Result for the number of STS Path FEBE errors.
Response: <NR1 Numeric>
Example: sts_febe_err?
STS_FEBE_ERR 144

COMMAND: sts_febe_rat?

ACTION: Returns the Test Result for the STS Path FEBE Error Rate.
Response: <NR3 Numeric>
Example: sts_febe_rat?
STS_FEBE_RAT 9.1E-05

COMMAND: sts_fram_err?

ACTION: Returns the Test Result for the number of SONET Framing Pattern Errors, SONET Frames with an error in the A1/A2 framing bytes during the Test.
Response: <NR1 Numeric>
Example: sts_fram_err?
STS_FRAM_ERR 7

COMMAND: sts_oof?

ACTION: Returns the Test Result for the status of STS Out Of Frame.
Response: CLEAR , CUR or HIST
Example: sts_oof?
STS_OOF HIST

NOTE: CUR is only available for the currently running test.

COMMAND: test_format [long,short]

ACTION: Sets the End of Test report format type.
- short - A concise report containing the Test Setup, Test Times and only the errored information.
- long - A longer report containing both the errored and error free data.

Example: test_format long

COMMAND: test_format?

ACTION: Returns the Test Format setting.
Response: LONG or SHORT

Example: test_format?
TEST_FORMAT SHORT

COMMAND: test_mode [untimed,timed,repeat]

ACTION: Sets the Test Mode. The test, once started, will stop and start according to the mode:
- untimed - The test will continue until stopped by the front panel STOP, remote command, or power off.
- timed - The test will continue until stopped by the Test Length time-out, front panel STOP, remote command, or power off.
- Repeat - The test will continue until stopped by the Test Length time-out, front panel STOP, remote command, or power off. If the Test Length time-out occurs, the test will Repeat again, and so on.

Example: test_mode repeat

COMMAND: test_mode?

ACTION: Returns the current Test Mode.
Response: UNTIMED, TIMED or REPEAT

Example: test_mode?
TEST_MODE REPEAT

COMMAND: test_prev [previous,current]

ACTION: Sets the Test previous setting used to retrieve Test Results.
- previous - All test results returned through any of the Test Results remote commands will be from the previous to the current test.
- current - All test results returned will be from the currently running test. If no test is running and this is set to current, the data will be from the previously run test.

Example: test_prev previous

COMMAND: test_prev?

ACTION: Returns the current setting of the Test Previous control.
Response: PREVIOUS or CURRENT

Example: test_prev?
TEST_PREV CURRENT

COMMAND: test_print [previous,current]

ACTION: Prints the End of Test report of the specified test.
- previous - Prints the previous Test's end of test report.
- current - Prints an end of test report for the currently running test containing the data up to that point in the test.

Example: test_print current

COMMAND: test_squelch [on,off]

ACTION: Sets the Test Error Log squelch function On or Off.
- on - After 10 consecutive error log entries, the squelching will begin. After 10 consecutive error free seconds, the squelching will end. Both conditions will be logged.
- off - All errors will be logged.

Example: test_squelch off

COMMAND: test_squelch?

ACTION: Returns the Test squelch setting.
Response: ON or OFF

Example: test_squelch?
TEST_SQUELCH OFF

COMMAND: test_state [run,stop]

ACTION: Sets the test run state. When running, test measurements will be made.
run - starts a new test, if no test in progress.
stop- stops current test, if currently in progress.
Example: test_state run

COMMAND: test_state?

ACTION: Returns the Test Run state.
Response: RUN or STOP.
Example: test_state?
TEST_STATE RUN

COMMAND: test_time [s]

ACTION: Sets the Test Length to the time specified by 's', where the time is of the format 'D-HH:MM:SS' (Minimum length 0-00:00:01):
D - days, 0 to 9
HH - hours, 0 to 23
MM - minutes, 0 to 59
SS - seconds, 0 to 59
Example: test_time '0-01:00:00'

COMMAND: test_time?

ACTION: Returns the current Test Time Length.
Response: <String response>
in format 'D-HH:MM:SS'
Example: test_time?
TEST_TIME '0-01:00:00'

COMMAND: vt_ais?

ACTION: Returns the Test Result for the status of VT Path AIS.
Response: CLEAR , CUR or HIST
Example: vt_ais?
VT_AIS CLEAR

NOTE: CUR is only available for the currently running test.

COMMAND: vt_bip2_err?

ACTION: Returns the Test Result for the number of VT1.5 BIP-2 errors.
Response: <NR1 Numeric>
Example: vt_bip2_err?
VT_BIP2_ERR 3

COMMAND: vt_bip2_rate?

ACTION: Returns the Test Result for the VT1.5 BIP-2 Error Rate.
Response: <NR3 Numeric>
Example: vt_bip2_rate?
VT_BIP2_RATE 0.3E-09

COMMAND: vt_febe_err?

ACTION: Returns the Test Result for the number of VT Path FEBE errors.
Response: <NR1 Numeric>
Example: vt_febe_err?
VT_FEBE_ERR 12

COMMAND: vt_febe_rate?

ACTION: Returns the Test Result for the VT Path FEBE Error Rate.
Response: <NR3 Numeric>
Example: vt_febe_rate?
VT_FEBE_RATE 4.5E-05

COMMAND: vt_v5?

ACTION: Returns the current value of the VT OverHead byte V5.
Response: <Non-decimal Numeric>
Example: vt_v5?
VT_V5 #H44

COMMAND: vt_yellow?

ACTION: Returns the Test Result for the status of VT Path Yellow.
Response: CLEAR , CUR or HIST
Example: vt_yellow?
VT_YELLOW CUR

NOTE: CUR is only available for the currently running test.

D.6 LED STATUS COMMANDS

COMMAND: histry_reset

ACTION: Clears ALL of the History status indicators and the Front Panel History LEDs.

COMMAND: led_stat?

ACTION: Returns the current/Test Result status for all of the following Front Panel LED conditions. This will be an overall status. If one or more conditions are CUR, then this will return CUR. If none are CUR and one or more are HIST, then this will return HIST. If all are clear, then this will return CLEAR.
Response: CLEAR , CUR or HIST
Example: led_stat?
LED_STAT CLEAR

COMMAND: line_ais?

ACTION: Returns the current/Test Result status for Line AIS (FP STATUS LED - LINE AIS).
Response: CLEAR , CUR or HIST
Example: line_ais?
LINE_AIS CLEAR

COMMAND: line_b2?

ACTION: Returns the current/Test Result status for B2 Errors (FP STATUS LED - LINE B2).
Response: CLEAR , CUR or HIST
Example: line_b2?
LINE_B2 HIST

COMMAND: line_ferf?

ACTION: Returns the current/Test Result status for Line FERF (FP STATUS LED - LINE FERF).
Response: CLEAR , CUR or HIST
Example: line_ferf?
LINE_FERF CUR

COMMAND: line_lop?

ACTION: Returns the current/Test Result status for Loss Of Pointer (FP STATUS LED - LINE LOP).
Response: CLEAR , CUR or HIST
Example: line_lop?
LINE_LOP HIST

COMMAND: path_ais?

ACTION: Returns the current/Test Result status for Path AIS (FP STATUS LED - PATH AIS).
Response: CLEAR , CUR or HIST
Example: path_ais?
PATH_AIS HIST

COMMAND: path_b3?

ACTION: Returns the current/Test Result status for B3 Errors (FP STATUS LED - PATH B3).
Response: CLEAR , CUR or HIST
Example: path_b3?
PATH_B3 CUR

COMMAND: path_yel?

ACTION: Returns the current/Test Result status for Path Yellow Alarm (FP STATUS LED - PATH YEL).
Response: CLEAR , CUR or HIST
Example: path_yel?
PATH_YEL HIST

COMMAND: sect_b1?

ACTION: Returns the current/Test Result status for B1 Errors (FP STATUS LED - SECTION B1).
Response: CLEAR , CUR or HIST
Example: sect_b1?
SECT_B1 HIST

COMMAND: sect_loc?

ACTION: Returns the current/Test Result status for Loss Of Clock (FP STATUS LED - SECTION LOC).
Response: CLEAR , CUR or HIST
Example: sect_loc?
SECT_LOC HIST

COMMAND: sect_lof?

ACTION: Returns the current/Test Result status for Loss Of Frame (FP STATUS LED - SECTION LOF).
Response: CLEAR , CUR or HIST
Example: sect_lof?
SECT_LOF CUR

COMMAND: sect_los?

ACTION: Returns the current/Test Result status for Loss Of Signal (FP STATUS LED - SECTION LOS).
Response: CLEAR , CUR or HIST
Example: sect_los?
SECT_LOS CLEAR

D.7 MISCELLANEOUS COMMANDS

COMMAND: header [on,off]

ACTION: Sets the remote command response header status:
- on - Responses include command header (command name).
- off - Disables header in response.

Example: header on

COMMAND: header?

ACTION: Returns the remote command response header status.
Response: ON or OFF.

Example: header?
HEADER ON
header off
header?
OFF

COMMAND: logo?

ACTION: Returns the ST-103 Logo (RS-232 only).

Example: logo?
MICROWAVE LOGIC ST-103 RX V1.0

COMMAND: print_enab [on,off]

ACTION: Sets the MASTER ENABLE for the ST-103 print functionality.
- on - Printouts are allowed.
- off - No printout to any port is allowed

Example: print_enab on

COMMAND: print_enab?

ACTION: Returns the print MASTER ENABLE setting.
Response: ON or OFF

Example: print_enab?
PRINT_ENAB OFF

COMMAND: print_port [parallel,serial,gpib]

ACTION: Redirects the Printer Port.
- parallel - Output to parallel printer.
- serial - Output to RS-232C port.
- gpib - Output to GPIB port.

Example: print_port serial

COMMAND: print_port?

ACTION: Returns the current printer port.
Response: PARALLEL , SERIAL or GPIB

Example: print_port?
PRINT_PORT SERIAL

COMMAND: print_string [s]

ACTION: Prints the string 's'.

Example: print_string 'Test by John D.'

COMMAND: rs_echo [on,off]

ACTION: Sets the RS-232 Echo mode status:
- on - All RS-232 input echoed.
- off - Disables echo mode.

Example: rs_echo on

COMMAND: rs_echo?

ACTION: Returns the RS-232 echo mode status.
Response: ON or OFF.

Example: rs_echo?
RS_ECHO OFF

COMMAND: rs_pmt_lf [on,off]

ACTION: Sets the RS-232 Prompt Line-Feed (0AH) Control status:
- on - Line-Feed (0AH) sent after RS-232 prompt.
- off - Line-Feed (0AH) not sent.

Example: rs_pmt_lf on

COMMAND: rs_pmt_lf?

ACTION: Returns the RS-232 Prompt Line-Feed (0AH) Control status.
Response: ON or OFF.

Example: rs_pmt_lf?
RS_PMT_LF OFF

COMMAND: rs_prompt [s]

ACTION: Sets the RS-232 prompt to the string 's'. Maximum length is 8 characters.

Example: rs_prompt 'ST103> '

COMMAND: **rs_xon_xoff [on,off]**

ACTION: Sets the RS-232 XON/XOFF protocol status:
on - Enables the XON/XOFF protocol.
off - Disables the XON/XOFF protocol.
Example: **rs_xon_xoff on**

COMMAND: **rs_xon_xoff?**

ACTION: Returns the RS-232 XON/XOFF status.
Response: ON or OFF.
Example: **rs_xon_xoff?**
RS_XON_XOFF OFF

COMMAND: **tse [n]**

ACTION: Sets the Test Status Enable Register, used for Service Requests over GPIB, to 'n':
0 to 255

COMMAND: **tse?**

ACTION: Returns the current contents of theTest Status Enable Register.
Response: <NR1 Numeric>.

COMMAND: **tsr?**

ACTION: Returns the current contents of theTest Status Register.
Response: <NR1 Numeric>.

NOTE: See Section 11 for information on using the Test Status commands.

D.8 IEEE-488 COMMON COMMANDS

COMMAND: ***cls**

ACTION: Clear Status, clears the Standard Event Status Register
Example: ***cls**

COMMAND: ***ese [n]**

ACTION: Sets the Standard Event Status Enable Register to 'n':
0 to 255
Example: ***ese 255**

COMMAND: ***ese?**

ACTION: Returns the current contents of the Standard Event Status Enable Register.
Response: <NR1 Numeric>
Example: ***ese?**
255

COMMAND: ***esr?**

ACTION: Returns the current contents of the Standard Event Status Register.
Response: <NR1 Numeric>
Example: ***esr?**
0

COMMAND: ***idn?**

ACTION: Returns the ST-103 identification as follows:
Response: Manufacturer, Model, 0, Firmware Level
Example: ***idn?**
MICROWAVE LOGIC, ST-103 RX, 0, V1.0

COMMAND: ***lrn?**

ACTION: Returns the current device setup, as a series of message units that can be later sent back to the ST-103 to restore the unit to the same setup.
Response: sequence of response messages previously defined
Example: ***lrn?**
VIEW_ANGLE 3 ; ...

COMMAND: *opc

ACTION: Operation Complete Command, sets the operation complete message in the Standard Event Status Register immediately, because all device operations are completed immediately.

COMMAND: *opc?

ACTION: Returns the value '1' immediately.
Response: <NR1 Numeric>
Example: *opc?
1

COMMAND: *rst

ACTION: Performs a device reset, resetting the ST-103 to the factory supplied setup, see Appendix E.

COMMAND: *sre [n]

ACTION: Sets the Service Request Enable Register to 'n':
0 to 255
Example: *sre 255

COMMAND: *sre?

ACTION: Returns the current contents of the Service Request Enable Register, where bit 6 is ignored.
Response: <NR1 Numeric>
Example: *sre?
191

COMMAND: *stb?

ACTION: Returns the current contents of the Status Byte, where bit 6 is the Master Summary Status bit.
Response: <NR1 Numeric>
Example: *stb?
96

COMMAND: *tst?

ACTION: Returns the result of the self-test. Successful completion of the test will return a value of '0'. The scope of the test is limited.
Response: <NR1 Numeric>
Example: *tst?
0

COMMAND: *wai

ACTION: Wait To Continue, forces the ST-103 to stop processing remote commands, until all operations are completed, which is immediately.
Example: *wai

NOTE: All IEEE-488 Common command queries do NOT return the command header in ther response.

NOTE: See Section 11, "GPIB Status Reporting", for information concerning the usage of the Standard Event Status Enable Register, the Standard Event Status Register, the Service Request Enable Register, and the Status Byte.

APPENDIX E

RECEIVER FACTORY DEFAULT SETTINGS

The following is a list of Factory default settings for the ST-103 Rx. These are the values for the various operating parameters that will be used under the following conditions:

When the unit leaves the factory,

When the non-volatile RAM is corrupted,

When the remote command '*rst' is sent, and

When one of the Quick Setups are recalled.

These settings can be changed by the user,and stored in non-volatile RAM. Should the non-volatile RAM be corrupted (due to battery failure) the unit will reset all settings as listed here and the message 'RAM CORRUPTION' will appear on the display for a few seconds to note that all settings are reset.

RETURNING to FACTORY DEFAULT SETTINGS

Resetting the unit to Factory default can be done in two ways:

by recalling the proper Quick setup,

by sending the remote '*rst' command via the GPIB or RS-232C interface.

NOTE: Use caution when returning to Factory default settings as any programmed parameters will be over written with the quick setup patterns listed here.

The following pages contain the setup information for the Quick Setups. The only parameters listed are the ones that are changed when the setup is recalled.

QUICK SETUP #0

'STSX-1, DS3 PAYLOAD'

MODE

DSX Bipol Level	TERM
Input Mode	
Signal Rate	STS1
Clock Mode	REC
Data Type	BIPOL
STS Descrambler	ON

SPE/DSX

Payload enabled	DS3
DS3 Payload	
Auto Pattern Search	OFF
Framing	M13
Pattern	PRBS

MEASUREMENT

STS-N Channel to monitor	1

QUICK SETUP #1

'STSX-1, VT1.5 PAYLOAD'

MODE

DSX Bipol Level	TERM
Input Mode	
Signal Rate	STS1
Clock Mode	REC
Data Type	BIPOL
STS Descrambler	ON

SPE/DSX

Payload enabled	VT1.5
VT Payload	
Auto Pattern Search	OFF
Channel	1
Framing	UNFRAMED
Mapping	FLOATING
Pattern	QRW

MEASUREMENT

STS-N Channel to monitor	1

QUICK SETUP #2

'OC3, DS3 PAYLOAD'

MODE

DSX Bipol Level	TERM
Input Mode	
Signal Rate	STS3
Clock Mode	REC
Data Type	OPTIC
STS Descrambler	ON

QUICK SETUP #2 (CONT)

SPE/DSX

Payload enabled	DS3
DS3 Payload	
Auto Pattern Search	OFF
Framing	M13
Pattern	PRBS

MEASUREMENT

STS-N Channel to monitor	1

QUICK SETUP #3

'OC3, VT1.5 PAYLOAD'

MODE

DSX Bipol Level	TERM
Input Mode	
Signal Rate	STS3
Clock Mode	REC
Data Type	OPTIC
STS Descrambler	ON

SPE/DSX

Payload enabled	VT1.5
VT Payload	
Auto Pattern Search	OFF
Channel	1
Framing	UNFRAMED
Mapping	FLOATING
Pattern	QRW

MEASUREMENT

STS-N Channel to monitor	1

QUICK SETUP #4

'DSX-3 INPUT MODE'

MODE

DSX Bipol Level	TERM
Input Mode	
Signal Rate	DSX-3
Clock Mode	REC
Data Type	BIPOL

SPE/DSX

Payload enabled	DS3
DS3 Payload	
Auto Pattern Search	OFF
Framing	M13
Pattern	PRBS

MEASUREMENT

STS-N Channel to monitor	1

QUICK SETUP #5

'DSX-1 INPUT MODE'

MODE

DSX Bipol Level	TERM
Input Mode	
Signal Rate	DSX-1
Clock Mode	REC
Data Type	BIPOL

SPE/DSX

Payload enabled	VT1.5
VT Payload	
Auto Pattern Search	OFF
Channel	1
Framing	UNFRAMED
Mapping	FLOATING
Pattern	QRW

MEASUREMENT

STS-N Channel to monitor	1

QUICK SETUP #6

'OC12, DS3 PAYLOAD'

MODE

DSX Bipol Level	TERM
Input Mode	
Signal Rate	STS12
Clock Mode	REC
Data Type	OPTIC

SPE/DSX

Payload enabled	DS3
DS3 Payload	
Auto Pattern Search	OFF
Framing	M13
Pattern	PRBS

MEASUREMENT

STS-N Channel to monitor	1

QUICK SETUP #7

'OC12, VT1.5 PAYLOAD'

MODE

DSX Bipol Level	TERM
Input Mode	
Signal Rate	STS12
Clock Mode	REC
Data Type	OPTIC

SPE/DSX

Payload enabled	VT1.5
VT Payload	
Auto Pattern Search	OFF
Channel	1
Framing	UNFRAMED
Mapping	FLOATING
Pattern	QRW

MEASUREMENT

STS-N Channel to monitor	1

*QUICK SETUP #8 (FACTORY DEFAULT / *rst)*

'MASTER DEFAULT'

MODE

Audio Volume	3
DSX Bipol Level	TERM
Input Mode	
Signal Rate	STS1
Clock Mode	REC
Data Type	BIPOL
STS Descrambler	ON
Trigger Setup	
ARMing	OFF
Trigger On	A1
Byte Value	0x00
Byte Mask	0xFF
Frames After Trigger	10
Trigger Source	INT
Storage Type	ALL
View Angle	7

SPE/DSX

Payload enabled	DS3
DS3 Payload	
Auto Pattern Search	OFF
Framing	M13
Pattern	PRBS
VT Payload	
Auto Pattern Search	OFF
Channel	1
Framing	UNFRAMED
Mapping	FLOATING
Pattern	QRW

MEASUREMENT

STS-N Channel to monitor	1
Printer Mode	OFF
Test Setup	
Mode	UNTIMED
State	RUN
Time	00-00:00:10
Test Prev	PREVIOUS
Test Squelch	OFF
Test Format	SHORT

MISCELLANEOUS

Remote mode	LOCAL
RS-232C	
Prompt	ST-103>
BAUD rate	9600
Parity	EVEN
Character size	8 bits
EOL	CR / LF
XON/XOFF	ON
Echo	ON
Prompt Line-Feed	OFF

GPIB

Address	14
GPIB bus control status	TALK/LISTEN
GPIB terminator	EOI/LF
Remote command response header	ON
Printer	
Printer Port	PARALLEL
Print Enable	ON
Test Status Enable Register	0

RECEIVER REMOTE COMMAND NAMES

The following lists contain all of the remote commands for the ST-103 Receiver. The two lists are provided for reference. One list is an alphabetical listing.The other lists the commands by functionality.

In the following lists, the full command name is shown. Sending the full command name to the ST-103 is not necessary. For any command, all that is needed is enough to make it unique. For example, if two commands begin with 'Q', but the second letter of each is different, all that is needed for either is two letters, which make them unique from any other command. This is the minimum number of letters that are needed to specify a command. This minimum will be shown with each command by upper case.

Example: VIew_angle [n]

This command can be used by sending any of the following:

'vi', 'vie', 'view', 'view_', 'view_a', ..., 'view_angle'

The command parameters are specified as follows:

[ITEM1,...,ITEMN] - Any item from the selection list.

<NRx> - Any of the following:
signed integer <NR1>,
floating point without exponent <NR2>,
or floating point with exponent <NR3>.

<Non-decimal Numeric> - Non-decimal integer, which can be in Hexadecimal, Octal, or Binary format.

<qstring> - Quoted ASCII string.

ALPHABETICAL LISTING

***CLS**
***ESE** <NRx>
***ESR?**
***IDN?**
***LRN?**
***OPC**
***RST**
***SRE** <NRx>
***STB?**
***TST?**
***WAI**

APS_Byte?
APS_Count?
APS_Dur?
APS_INC?
APS_INV?
AUdio_vol <NRx>

B1_Ber?
B1_ERr?
B1_ES?
B1_Per_efs?
B1_SEFs?
B1_SES?
B2_Ber?
B2_ERr?
B2_ES?
B2_Per_efs?
B2_Ses?
B3_Ber?
B3_ERr?
B3_ES?
B3_Per_efs?
B3_Ses?
BPV_Err?
BPV_Rate?

CLock [NRZ,REC]

DATA [NRZ_ECL,NRZ_DIFF,BIPOL,OPTIC]
DATE <qstring>
DS_Ais?
DS_BIT_Err?
DS_BIT_Rate?
DS_Fram_err?
DS_LOF?
DS_LOP?
DS1_CRC6_Err?
DS1_CRC6_Rat?
DS1_Yellow?
DS3_Auto [ON,OFF]
DS3_Framing [M13,CBIT,UNFRAMED]
DS3_Idle?
DS3_PAR_Err?
DS3_PAR_Rate?
DS3_PATtern [PRBS,WORD]
DS3_Xbit?
DSX_level [TERMINATE,BRIDGE]

EDit_setup <NRx>,<qstring>
EDit_setup? <NRx>
ELap_time?

FRAME_Data?<NRx>
FRAME_Number<NRx>
FRAME_Range?

GPIB_Address <NRx>
GPIB_Bus [TALK_LISTEN,OFF_BUS]

HEader [ON,OFF]
HIstry_reset

LEd_stat?
LINE_Ais?
LINE_B2?
LINE_Ferf?
LINE_Lop?
LOG_Clear
LOG_Print
LOGO?

OH_All?
OH_BYTE? <qstring>
OH_BYTE_Off? <NRx>
OPtions?

PATH_Ais?
PATH_B3?
PATH_Yel?
PRINT_Enab [ON,OFF]
PRINT_Mode [EOT,LOG,OFF,BOTH]
PRINT_Port [PARALLEL,SERIAL,GPIB]
PRINT_String <qstring>
PYld_enab [VT,DS3]

Quick_setup <NRx>

REcall_setup <NRx>
RS_Echo [ON,OFF]
RS_PMt_lf [ON,OFF]
RS_PRompt <qstring>
RS_Xon_xoff [ON,OFF]

SAve_setup <NRx>
SECT_B1?
SECT_LOC?
SECT_LOF?
SECT_LOS?
SIgnal [STS1,STS3,STS12,DSX1,DSX3]
SPE_NDf?
SPE_NEg_pj?
SPE_POInter?
SPE_POS_pj?
SPE_Rng?
STArt_time?
STOP_time?
STORed?
STS_Channel <NRx>
STS_Descr [ON,OFF]
STS_FEBE_Err?
STS_FEBE_Rat?
STS_FRam_err?
STS_Oof?

TEST_Format [LONG,SHORT]
TEST_Mode [UNTIMED,TIMED,REPEAT]
TEST_PREv [PREVIOUS,CURRENT]
TEST_PRInt [PREVIOUS,CURRENT]
TEST_SQuelch [ON,OFF]
TEST_STate [RUN,STOP]
TEST_Time <qstring>
TIme <qstring>
TRIG_Arm [ON,OFF]
TRIG_Byte <qstring>
TRIG_Frames <NRx>
TRIG_Offset <NRx>
TRIG_SRc [INT,EXT]
TRIG_STore [ALL,TOH,SPE,POH]
TRIG_Word <Non-Decimal Numeric>,
<Non-Decimal Numeric>
TSE<NRx>
TSR?
VIew_angle <NRx>
VT_AIs?
VT_AUto [ON,OFF]
VT_BIP2_Err?
VT_BIP2_Rate?
VT_Channel <NRx>
VT_FEBE_Err?
VT_FEBE_Rate?
VT_FRaming [UNFRAMED,D4,ESF]
VT_Lop?
VT_Mapping [LOCKED,FLOATING]
VT_NDf?
VT_NEg_pj?
VT_PAttern
[WORD, PRBS_9, PRBS_15,
PRBS_20, PRBS_23, QRW]
VT_POInter?
VT_POS_pj?
VT_Rng?
VT_Scan?<NRx>
VT_V5?
VT_Yellow?

FUNCTIONAL LISTING

MODE Commands

AUdio_vol <NRx>

CLock [NRZ,REC]

DATA [NRZ_ECL,NRZ_DIFF,BIPOL,OPTIC]
DATE <qstring>
DSX_level [TERMINATE,BRIDGE]

EDit_setup <NRx>,<qstring>
EDit_setup? <NRx>

FRAME_Data?<NRx>
FRAME_Number<NRx>
FRAME_Range?

GPIB_Address <NRx>
GPIB_Bus [TALK_LISTEN,OFF_BUS]

OPtions?

Quick_setup <NRx>

RECall_setup <NRx>

SAve_setup <NRx>
SIgnal [STS1,STS3,STS12,DSX1,DSX3]
STORed?
STS_Descr [ON,OFF]

TIme <qstring>
TRIG_Arm [ON,OFF]
TRIG_Byte <qstring>
TRIG_Frames <NRx>
TRIG_Offset <NRx>
TRIG_SRc [INT,EXT]
TRIG_STore [ALL,TOH,SPE,POH]
TRIG_Word <Non-Decimal Numeric>,
<Non-Decimal Numeric>

VIew_angle <NRx>
VT_Scan?<NRx>

SPE/DSX Commands

DS3_Auto [ON,OFF]
DS3_Framing [M13,CBIT,UNFRAMED]
DS3_PATtern [PRBS,WORD]

PYld_enab [VT,DS3]

VT_AUto [ON,OFF]
VT_Channel <NRx>
VT_FRaming [UNFRAMED,D4,ESF]
VT_Mapping [LOCKED,FLOATING]
VT_PAttern [WORD, PRBS_9, PRBS_15,
PRBS_20, PRBS_23, QRW]

POINTER Commands

SPE_NDf?
SPE_NEg_pj?
SPE_POInter?
SPE_POS_pj?
SPE_Rng?

VT_Lop?
VT_NDf?
VT_NEg_pj?
VT_POInter?
VT_POS_pj?
VT_Rng?

TOH/POH Commands

OH_All?
OH_BYTE? <qstring>
OH_BYTE_Off? <NRx>

MEASUREMENT Commands

APS_Byte?
APS_Count?
APS_Dur?
APS_INC?
APS_INV?

B1_Ber?
B1_ERr?
B1_ES?
B1_Per_efs?
B1_SEFs?
B1_SES?
B2_Ber?
B2_ERr?
B2_ES?
B2_Per_efs?
B2_Ses?

B3_Ber?
B3_ERr?
B3_ES?
B3_Per_efs?
B3_Ses?
BPV_Err?
BPV_Rate?

DS_Ais?
DS_BIT_Err?
DS_BIT_Rate?
DS_Fram_err?
DS_LOF?
DS_LOP?
DS1_CRC6_Err?
DS1_CRC6_Rat?
DS1_Yellow?
DS3_Idle?
DS3_PAR_Err?
DS3_PAR_Ra e?
DS3_Xbit?

MEASUREMENT Commands (Cont)

ELap_time?

LOG_Clear
LOG_Print

PRINT_Mode [EOT,LOG,OFF,BOTH]

STArt_time?
STOP_time?
STS_Channel <NRx>
STS_FEBE_Err?
STS_FEBE_Rat?
STS_FRam_err?
STS_Oof?

TEST_Format [LONG,SHORT]
TEST_Mode [UNTIMED,TIMED,REPEAT]
TEST_PREv [PREVIOUS,CURRENT]
TEST_PRInt [PREVIOUS,CURRENT]
TEST_SQuelch [ON,OFF]
TEST_STate [RUN,STOP]
TEST_Time <qstring>

VT_AIs?
VT_BIP2_Err?
VT_BIP2_Rate?
VT_FEBE_Err?
VT_FEBE_Rate?
VT_V5?
VT_Yellow?

STATUS Commands

HIstry_reset

LEd_stat?
LINE_Ais?
LINE_B2?
LINE_Ferf?
LINE_Lop?

PATH_Ais?
PATH_B3?
PATH_Yel?

SECT_B1?
SECT_LOC?
SECT_LOF?
SECT_LOS?

MISCELLANEOUS Commands

HEader [ON,OFF]

LOGO?

PRINT_Enab [ON,OFF]
PRINT_Port [PARALLEL,SERIAL,GPIB]
PRINT_String <qstring>

RS_Echo [ON,OFF]
RS_PMt_lf [ON,OFF]
RS_PRompt <qstring>
RS_Xon_xoff [ON,OFF]

TSE<NRx>
TSR?

IEEE-488 Common Commands

*CLS
*ESE <NRx>
*ESR?
*IDN?
*LRN?
*OPC
*RST
*SRE <NRx>
*STB?
*TST?
*WAI

TRANSMITTER SPECIFICATIONS

14.1 INTERFACES

14.1.1 TIMING SYNCHRONIZATION **Internal:** SONET, 51.84MHz+/- 10 ppm.

External: SONET, 51.84MHz, 155.52MHz, 622.08MHz (OC-12 Optional) at +/- 1% ppm, ECL level.

External DS1 Signal: 1.544 Mhz +/- 5 ppm. Bipolar input, 100 ohms balanced, 6vpp nominal, front panel 310 jack.

External DS1 Clock:1.544 Mhz +/- 5 ppm. TTL level signal terminated DC, 50 ohms to ground, rear panel BNC connector.

14.1.2 STS-1 Interfaces

Data-Bipolar: Qty three, B3ZS encoded, 75 ohm, STS-1 outputs. Front panel meets requirements of TR-NWT-253 Figure 4-10. Output amplitude adjustable +/- 6 dB, in 1 dB increments from nominal level.

DATA-ECL: Qty one, STS-1 output, rear panel, 50 ohm BNC, terminate 50 ohms to -2.0V.

CLOCK-ECL: Qty one, STS-1 output, rear panel, 50 ohm BNC. Duty cycle 50+/- 10% max. Rising edge in center of ECL DATA bit+/- 2ns. Terminate 50 ohms to -2.0V.

SYNC-ECL: Qty one, STS-1 Frame Sync output, rear panel, 50 ohm BNC. Active High, one bit wide at two time slots before bit one of A1 frame bytes of DATA-ECL. Terminate 50 ohms to -2.0V.

PROGRAMMABLE SYNC-TTL: Qty one, output, rear panel, 50 ohm BNC. Sync is one STS-1 byte wide and coincides with the user selected STS-1 DATA-ECL byte. Terminate 50 ohms to -2.0V.

14.1.3 STS-3 Interfaces

DATA-OPTICAL
Qty one, output, front panel, OC3, single mode, 1300nm, FC/PC connector. Typical power out -10 dBm, maximum -7 dBm, minimum -13 dBm.

DATA-ECL: Qty one, output, rear panel, NRZ, 50 ohm BNC. Terminate 50 ohms to -2.0V.

CLOCK-ECL: Qty one, output, rear panel, 50 ohm BNC. Terminate 50 ohms to -2.0V. Duty cycle 50 +/-10% maximum. Rising edge is aligned +/-1 ns in the center of STS-3 DATA-ECL bit.

14.1.4 Auxillary Interfaces

External DS3 Signal: 44.736 MHz +/-20ppm. B3ZS encoded bipolar input, 75 ohms balance, front panel.

EVENT TRIGGER: Qty one, rear panel, TTL level, 50 ohm BNC. Signal synchronously changes to a low state upon activation of errors and alarms:

TOH/POH Errors	LOS	Frame Byte Error
Line AIS	Path AIS	VT Path AIS
STS Path Yellow	Line FERF	APS Byte Switching

EXT SPE STUFF POLARITY: Qty one, input, rear panel, TTL level, 50 ohm BNC. Allows Stuff polarity to be changed; High, next Stuff will be positive; Low, next Stuff will be negative. Activated by selecting EXT in any SPE Pointer menus.

14.2 FRAME STRUCTURE

STS-1: Composition; Per TR-NWT-000253; 9 Row x 90 Byte, 125 microsec frame time. VT1.5, Asynchronous DS3.

STS-3: Repeats internal STS-1 frame 3 times.

14.3 PARITY GENERATION

VTx: BIP-2 calculated and inserted for tributaries.

STS-1: B1, B2 and B3 calculated and inserted.

DS3: M13 or C-bit.

STS-3: B1 calculated and inserted.

STS-12: B1 calculated and inserted (OC-12 Option).

14.4 TRANSPORT AND PATH OVERHEAD EDITING

14.4.1 Default Setting

Section Overhead

a) Framing sequence defaults to A1, A2 = F6, 28.

b) STS-1 ID byte C1 defaults to 01.

c) B1 contains the BIP-8 as defined in TR-NWT-253.

d) E1,F1,D1-D3 default to 00.

Line Overhead:

a) H1,H2 contain the SPE pointer as defined in TR-NWT-253.

b) H3 in the pointer action byte as defined in TR-NWT-253.

c) B2 contains the BIP-8 as defined in TR-NWT-253.

d) K1, K2 APS bytes default to 00.

e) D7-D12, Z1, Z2, and E2 default to 00.

Path Overhead:

a) J1 trace byte defaults to ASCII null 00.

b) B3 contains the BIP-8 as defined in TR-NWT-253.

c) C2 Signal Label byte defined by payload options.

d) G1 status byte default to 00.

e) H4 byte is modified according to payload options.

f) F2, Z3-Z5 bytes default to 00.

VT1.5 Floating Bit Asynchronous:

a) V1-V2 Pointer bytes as defined in TR-NWT-253.

b) V3 pointer action byte as defined in TR-NWT-253.

c) V4 defaults to 00.

d) V5 as defined in TR-NWT-253.

e) Simplified H4 coding.

VT1.5 Locked Bit Synchronous:

a) V1-V4 default to 00.

14.4.2 Edit Options

Byte Modification: All of the Line, Section and Path Overhead bytes, except the B1-B3, C1 and H1-H4 bytes, can be modified by entering hex values in the edit menu.

Overhead Error Injection: The Overhead error menu allows the user to modify the same bytes for a user specified number of frames (1-255 or continuously). See the Error Generation Section.

14.5 SYNCHRONOUS PAYLOAD ENVELOPE (SPE) POINTER CONTROL

14.5.1 Stuffing Operations

General: User can generate positive and negative stuffing operations as either single justifications or rates. All pointer operations follow the pointer adjustment procedures outlined in TR-NWT-253. The Burst and two Periodic Stuff modes described below are in accordance with T1X1.6/90-01. Stuffing operations apply only to internal payloads.

Linear Stuff: Rates are user defined stuff operations whereby a stuff is created every nth frame for a total of m times. The user enters the nth frame occurrence of a stuff and the m total stuffs to perform. The range of m is 1-1023 or continuous; the range of n is 3-131, 072.

Burst: Three Pointer adjustments, separated by 4 frames, are made each measurement interval. The number of measurements and measurement interval is user definable.

Periodic: Periodic with addition or cancellation adjustments are made each measurement interval. The number of measurements and measurement interval is user definable.

14.5.2 SPE New Data Flag (NDF) Operations

New Data Flag: NDF operations cause the pointer to jump to a new location defined by the user entry. A valid entry is 0 to 782.

14.6 PAYLOAD

14.6.1 Tributary VT1.5 (DS1, Int or Ext)

General: A single internally generated or externally supplied asynchronous DS1 signal is mapped into a user specified channel of an STS-1 payload per TR-NWT-253.

Payload Structure: One of the 28 channels will contain a user definable DS1 payload. The payload can be the internal DS1 generated pattern or an external DS1 signal that is mapped as an asynchronous payload. The contents of the other 27 background channels are a D4 framed internally defined fixed pattern with channel number identifier. The channel identifier is used by the receiver to determine mapping order relative to the transmitter. The user can select which channel (1-28) contains the active DS1 signal.

Internal DS1 Specifications:

a) Active channel pattern; PRBS 2^9-1, 2^{15}-1, 2^{20}-1, 2^{23}-1, QRW, 24 bit programmable

b) Background inactive channels pattern; unique 24 bit internally defined fixed word

c) Framing; unframed, D4 framed

External DS1 Specifications:

a) Pattern; no restriction

b) Framing; no restriction

Modes Supported:

a) Locked, bit synchronous per TR-NWT-253.

b) Floating, bit asynchronous per TR-NWT-253. Simplified H4 coding is used.

14.6.2 VT Pointer Control:

General

The VT pointer and pointer action bytes are contained in the V1-V4 bytes as indicated in TR-NWT-253. The VT path overhead byte is generated as defined in TR-NWT-253.

14.6.3 VT Stuffing Operations:

General: User can generate positive and negative stuffing operations as either single justifications or rates. Stuff rates are user defined stuff operations whereby a stuff is created every nth multiframe for a total of m times. The user enters the nth multiframe occurrence of a stuff and the m total stuffs to perform. The range of m is 1-255 or continuous; the range of n is 3-65,535. Stuffing operations apply only to internal payloads.

Linear Stuff: Rates are user defined stuff operations whereby a stuff is created every nth frame for a total of m times. The user enters the nth frame occurrence of a stuff and the m total stuffs to perform. The range of m is 1-1023 or continuous; the range of n is 3-131,072.

Burst: Three Pointer adjustments, separated by 4 frames, are made each measurement interval. The number of measurements and measurement interval is user definable.

Periodic: Periodic with addition or cancellation adjustments are made each measurement interval. The number of measurements and measurement interval is user definable.

14.6.4 VT New Data Flag (NDF) Operations

VT New Data Flag: VT NDF operations cause the pointer to jump to a new location defined by the user entry. A valid entry is 0 to 103.

14.6.5 STS-1 Level Mappings (DS3)

General: A single internally generated or externally supplied asynchronous DS3 signal is mapped into an STS-1 payload per TR-NWT-253.

Internal DS3 Specifications.

a) Frame patterns: M13, C-bit, unframed.

b) Payload patterns: PRBS, (inverted 2^{15}-1), 8 bit fixed word.

External DS3 Specifications.

a) B3ZS encoded DSX-3 bipolar input.

b) Type BNC 75 ohm input jack on front panel.

14.7 ALARM AND ERROR GENERATION

14.7.1 Section Layer

Loss of Signal (LOS): An all zeros pattern will be generated for a period of 1 to 150 microseconds.

Loss of Frame (LOF): An invalid A1, A2 framing byte can be transmitted by setting the frame bytes to invalid codes in the section overhead error editing menu. The user can program from 1 to 255 consecutive errored frames or continuously.

Section Bit Error Rate: Adjustable over the range of 10^{-3} to 10^{-9}, an error rate generated randomly in the output pattern. This error is allowed to happen anywhere in the STS-N frame. The receiver's bit error rate, based on B1, will equal the section error rate. Random single errors can also be injected.

Single Error Inject: A single B1 (only) error can be injected in the STS-1 frame. The error is caused by a bit inversion in the B1 byte before insertion into the STS-1 data stream.

Channel Error Inject: For STS-3 and STS-12 (Option) interfaces, a random error can be injected on a user selected channel. The channel number is defined by the C1 ID byte.

14.7.2 Line Layer

Line Alarm Indication Signal (AIS.): Per TR-NWT-253, valid section overhead will be generated and an all ones signal before scrambling will be generated on all other bytes. Note that this signal also causes STS path, VT path, and DS1 AIS conditions. Line AIS can be a burst for 1-255 frames or continuously injected.

Line Far End Receive Failure (FERF.): The transmitter inserts a 110 code in bit positions 6,7 and 8 of the K2 byte for 1-255 frames (five frames is the default) or continuously.

Line Bit Error Rate: A user set rate in the range of 10^{-3} to 10^{-9}. The received bit error rate based on B2 will be this injected rate.

Single Error Inject: A single B2 (only) error can be injected. The error is caused by a bit inversion in the B2 byte before insertion into the STS-1 data stream.

APS Byte Failure:

a) Invalid code sent for a user specified number of frames (1-255) or continuously. Invalid codes are defined as unused codes in Table 5-5 of TR-NWT-253. The user can choose from any one of the unused codes to send.

b) Inconsistent APS byte can be continuously sent or programmed to be sent in 12-255 frames. APS bytes are sent such that no 3 consecutive frames contain the same byte. The APS byte value toggles between the default value and a user selected value entered in the APS menu.

14.7.3 Path Layer

Loss of Pointer (Path LOP.):

a) The user can set continuous frames where a New Data Flag (NDF) is sent without changing the pointer value to simulate a stuck bit in a Network Element (NE).

b) A new pointer value can be sent without sending an NDF. The NDF value can be edited to check the majority vote circuits.

c) An out of range pointer can be sent accompanied by an NDF. An out of range pointer will be defined as a value greater than 782. Note that only an incorrect pointer number is transmitted. The SPE will remain in its previous position.

STS Path Yellow Alarm: This alarm is generated by setting bit 5 of the G1 byte to one. This signal can be generated continuously or in a user set number of frames (1-255) or continuously.

STS Path Bit Error Rate: A bit error rate in the range of 10^{-3} to 10^{-9} is generated based on B3.

Single Error Inject: A single B3 (only) error can be injected. The error is caused by a bit inversion in the B3 byte before insertion into the STS-1 data stream.

Pointer Errors: The user can set which particular "I" or "D" bits to invert. Based on majority voting, a Pointer Justification (PJ) will occur if 3 or more bits are inverted. If two or less bits are inverted, the pointer bits will be errored for one frame.

14.7.4 VT Layer

Loss of Pointer (VT LOP.): All of the following errors will occur on the active channel.

a) The user can set continuous frames where an NDF is sent without changing the VT pointer value to simulate a stuck bit in an NE.

b) A new pointer value can be sent without sending a new data flag. The NDF value can be edited to check the majority vote circuits.

c) An out of range pointer can be sent accompanied by an NDF. An out of range pointer will be defined as a value greater than that particular VT is allowed.

VT Path Yellow: A VT path yellow is generated by setting bit 8 of the V5 byte to a one. This condition can be generated continuously or on a user selected number of frames (1-255).

VT bit error rate: An error rate in the range of 10^{-4} to 10^{-9} generate based on the BIP-2 contained in the V5 byte.

Pointer errors: The user can set which particular "I" or "D" bits to invert. Based on majority voting, a Pointer Justification (PJ) will occur if 3 or more bits are inverted. If two or less bits are inverted, the pointer bits will be errored for one frame.

RECEIVER SPECIFICATIONS

15.1 INTERFACES

SONET:

STS-1, 51.84MHz Rate + /-20ppm.

STSX-1, Bridge or terminate levels, B3ZS, 75 ohm, BNC.

NRZ, ECL, 50 ohm to -2V, BNC.

Differential, 0.5Vp-p into 100 ohms, 2 BNCs with recovered or ECL clock.

Clock, ECL, 50 ohms to -2V, BNC.

STS3,155.52MHz Rate +/-20ppm

OC-3, 1300 nm, maximum input -9dBm, Sensitivity -25dBm typical, -22dBm minimum.

NRZ, ECL, 50 ohms to -2V, BNC, with recovered or ECL clock.

Clock, ECL, 50 ohms to -2V, BNC.

STS-12 see Options

Non-SONET:

DS1, 1.544 Mhz Rate +/- 130ppm.

DSX-1, B8ZS or AMI, 100 ohms balanced, Bridge or Terminate levels, 310 jack.

DS3, 44.736 MHz Rate +/- 20ppm.

DSX-3, Bridge or Terminate levels, B3ZS, 75 ohm, BNC with recovered or ECL clock.

NRZ, ECL, 50 ohms to -2V, BNC.

Differential, 0.5Vp-p into 100 ohms, 2 BNCs with recovered or ECL clock.

Clock, ECL 50 ohms to -2V, BNC.

Other Interfaces

FRAME CAPTURE TRIGGER - TTL level input, BNC, 1kohm to +5V, Low level activates trigger.

BIT ERROR - TTL level output, BNC, 50 ohms, High level during Bit Error on selected payload, DS1 or DS3 input.

B3 ERROR - TT1 level output, BNC, 50 ohms, High level 12 us pulse if any B3 errors are detected on the selected STS-1 during a frame.

TOH/POH Monitor- TTL level output, 50 pin monitor port for Transport and Path Overhead bytes. Parallel Data is valid on the rising edge of the Data Valid signal. The Sync signal indicates the first row in the column. Each of the three TOH and the POH columns have an 8 bit Data port.

The pin assignments are:

	Col 1 (A1...)	Col 2 (A2...)	Col 3 (C1...)	Col 4 (J1...)
LSB	1	5	9	13
	26	30	34	38
	2	6	10	14
	27	31	35	39
	3	7	11	15
	28	32	36	40
	4	8	12	16
MSB	29	33	37	41

TOH Data Valid, 18 POH Data Valid, 19

TOH Sync, 20 POH Sync, 21

Ground, 17, 42 thru 46.

15.2 FRAME DETECTION

STS-1: Detection based on A1, A2.

STS-3: Detection based on A1, A2, A2.

STS-12: Detection based on A1, A2, A2.

15.3 PARITY DETECTION

STS-1: B1, B2 and B3 are generated based on incoming signal and compared with corresponding bytes in succeeding frames in accordance with TA-253. Counts are made, processed and stored as described in paragraphs below.

DS3 (Payload or Input): M12 or C-bit frame parity is detected, compared and stored.

STS-3: B1 Parity is detected, compared and stored. B2 and B3 Parity is detected, compared and stored on a selected STS-1.

VT1.5 (Floating VT): BIP-2 is detected as defined in TA-253.

DS1 (Payload or Input): CRC-6 errors are detected and stored.

15.4 SONET MEASUREMENTS

Section:

a) B1 Coding Errors: Total, Rate, ESs, %EFSs
b) SEFS: Total
c) SESs: Total, for x or more CVs or OOF

RATE	x
STS-1	9
OC-3	16
OC-12	63

d) OOF
e) A1, A2 pattern errors

Line:

a) B2 Coding Errors: Total, Rate, ESs, %EFSs
b) SESs: Total, for x or more CVs or OOF

RATE	x
STS-1	12
OC-3	32
OC-12	124

c) LOP
d) Pointer out-of-range
e) FERF
f) APS byte failure
g) Invalid K1

STS Path:

a) B3: Total, Rate, ESs, %EFSs
b) SESs: Total, for 9 or more CVs or OOF
c) AIS
d) Yellow
e) FEBE
f) Selectable STS-1 of STS-3 or STS-12 (option)

VT Path (Floating VT):

a) BIP-2: Total, Rate, ESs, %EFSs
b) SESs: Total, for 9 or more CVs or OOF
c) AIS
d) Path Yellow
e) FEBE

Pointer: Detects and stores PJ or NDF on a selected VT

APS:

a) Protection Switching Counts (PSCs)-no of times switched from monitored to protection line
b) Protection Switching Duration (PSD)-no of seconds service removed from monitored line

Frame:

a) RAM "captures" last 40 STS-1 frames before/ after trigger
b) User defined start trigger, byte number and content
c) Hex display on LCD

15.5 DS-N MEASUREMENTS

DS3 (Payload or Input):

a) M13 or C-bit Parity: Rate, Total, ESs, %EFSs
b) Bit Errors, PRBS or fixed word: Rate, Total, ESs, %EFSs
c) BPV:
d) AIS, Idle, X-bit and all ones
e) FEBE

DS1 (Payload or Input):

a) Bit Errors, PRBS or fixed word: Rate, Total, ESs, %EFSs
b) BPV:
c) AIS, Yellow
d) CRC-6
e) Frame errors
f) OOF

15.6 TEST CONTROL

Time Set:

a) Single or Repeat test set from 1 second to 9 days in one second increments
b) Untimed
c) Date and clock control

15.7 TEST STORAGE

Time:

a) Current Test
b) Previous Test

Initialization: Local or remote

15.8 TEST RETRIEVAL

Local:

a) Selectable report format/content
b) Front panel call-up and display
c) Send to GPIB or RS-232C ports
d) Print to local printer

Remote:

a) Selectable report format/content
b) Polled Command/Response
c) GPIB or RS-232C
d) Output report to local printer

SECTION 16.0

GENERAL

Power: 115 Vac +/-10%, 100VA max.

Operating Temperature: 0 to 40 degrees C.
10 to 40 degrees C for OC-12

Size (each): 6"H x 14.4"W x 16.5"D
(152mm x 366mm x 419mm)

Weight: 22lbs (10kg)

Rack Mount (19"): 7"H (Optional)

SECTION 17.0

OC-12 OPTIONS

17.1 STS-12 (TRANSMITTER)

- Repeats internal STS-3 signal 4 times
- C1 ID insert: labels 1 to 12
- B1 calculation inserted Channel #1
- Single error inject to selected channel (1 to 12)
- Loss of Signal and Line AIS selection
- Error rate insertion 10^{-3} to 10^{-9}, random

Data Output

Single STS-12, Clock and Data

ECL nominal level

50 ohms to -2V termination

50 ohm SMA connectors

17.2 OC-12 OUTPUT (TRANSMITTER)

Optical Output:

OC-12

Power: -14dBm min, -11dBm typ, -7dBm max.
1300nm

Connector: FC/PC

Single mode laser

This output applies to the OC-3 when the OC-12 option is installed.

17.3 STS-12 (RECEIVER)

- 622MHz clock recovery circuit
- Frame synchronization, A1 A2 A2
- B1 error detection, count and rate
- Monitor user selected STS-1
- STS-12 input descrambler

STS-12 Input

ECL, DC coupled, 50 ohms to -2V, Clk & Data or Data only

SMA connector

17.4 OC-12 INPUT (RECEIVER)

Optical Input

Sensitivity: -25dBm typical
-22dBm minimum

Maximum input: -3dBm

Wavelength: 1200 - 1600 nm

Connector: FC/PC

MP MASTER
MA32960